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SOME CATERPILLAR PESTS OF THE TEA PLANT.

TOWARDS the end of last year (1899) there were numerous complaints, more particularly from the Dikoya district, of serious and repeated injury by the small leaf-twisting caterpillar known as the Tea Tortrix. It was suggested, by the then Chairman of the Planters' Association, that a circular on the subject would be of assistance to he planters. Having insufficient data for the purpose, I asked for further particulars and dates of recent visitations of the pest, together with memoranda of the total monthly rainfall in the districts concerned. In response to my request a circular letter was sent to the various branches of the Planters' Association asking for the required information. In due course a large packet of correspondence, the result of this circular letter, was submitted to me by the Secretary of the Planters' Association. It appears, however, that in the letter in question the pest was referred to as "The Caterpillar Pest;" and it was at once evident, from the nature of the replies, that each observer had applied the term to the particular pest that had been the most notorious in his district; and that the correspondence referred to some five or six distinct species of caterpillar. Under these circumstances I have thought it advisable to draw up a circular on Tea Caterpillars in general, giving detailed particulars of those species that rank as really serious pests. This plan will be quite convenient, as the general treatment suggested will be practically the same for all the different species.

As a rule, caterpillar pests are of less real importance, and much more readily controlled, than are many less conspicuous plagues, but there are some notable exceptions.

It will be well to briefly outline the life-history of insects of the Order *Lepidoptera* (Butterflies and Moths), of which the caterpillar, is but one of the earlier stages. The series consists of (1) Ovum, or Egg; (2) Larva, or Caterpillar; (3) Pupa, or Chrysalis (often enclosed in a cocoon); and (4) Imago, the Butterfly or Moth. This constitutes the single generation. A thorough knowledge of all these different stages is of great importance in the study of any injurious caterpillar. Such knowledge enables us to determine which may be the most vulnerable stage in the life of our enemy.

The destructive time is in all cases the caterpillar period, and to this stage, therefore, the chief attention must be paid.

With most of our caterpillar plagues in Ceylon a definite rise and fall is noticeable, commencing with a small brood, limited very possibly to three or four tea bushes only. Unfortunately this initial brood is almost invariably over-looked. Prompt measures at this time would prevent all further trouble. But these pioneer caterpillars are allowed to go through their transformations and eventually emerge as moths capable of reproducing their kind perhaps a hundred-fold. They distribute themselves throughout the surrounding tea, and pregnant individuals may be carried to distant quarters of the estate by the wind. They deposit their burden of eggs and die. In due course—varying according to the individual species from three or four weeks to as many months—a second and larger brood appears, very probably starting from several distinct centres. Even this more extensive brood may possibly not attract very much attention. The coolies observe a number of caterpillars about, but do not consider it their business to bring it to the notice of the superintendent. The consequence of this inattention is that a few weeks later the caterpillars appear in such countless numbers and effect such serious damage that it is impossible to overlook their presence. The superintendent becomes alarmed, collects and destroys as many of the caterpillars as he can, and probably prunes down the affected field

and burns the prunings, which is certainly the best thing to be done under the circumstances. But a large proportion of the insects is sure to escape, and a fourth or even fifth extensive plague of the caterpillars may appear at regular intervals. But a period is sure to arrive—varying usually from the third to the fifth brood—when the pest appears to reach its climax and to disappear as suddenly as it came, giving no further trouble perhaps for several years. This relief may be brought about by several circumstances. The natural enemies of the caterpillar (Ichneumon wasps and Tachinid flies) discover the plentiful supply of food and increase proportionately until they obtain the upper hand once more. A peculiar epidemic, allied to or identical with the disease that is sometimes so destructive to silkworms, often kills them wholesale, and is usually the principal agent in reducing the pest. This disease appears to be very infectious. Caterpillars killed by it become rotten and have a very offensive smell. The spores of the disease are distributed over the leaves of the plant and are eaten by the other caterpillars, which die in their turn. Fortunately the disease does not—as far as we know—affect the higher animals, but the process of tea manufacture would in any case purify the leaf. Weather is also probahly an important factor in the rise and fall of these caterpillar pests. Though it may not directly affect the caterpillar itself it may have a very appreciable effect upon the enemies of the oaterpillar. Thus, the damp warm atmosphere following copious showers of rain is particularly favourable to the growth and spread of the fungal epidemic mentioned above.

Remedial Measures.

In the case of leaf-feeding caterpillars considerable success has been obtained in other countries by spraying with mineral (usually arsenical) poisons. The Americans have paid great attention to these preparations, such as arsenate of lead and "green arsenoid," and are manufacturing them at rates that permit of their being freely employed. I have hitherto never recommended the use of mineral poisons for spraying tea plants, fearing the (possibly very remote) danger of the mineral accumulating in portions of the manufactured tea in poisonous quantities. But I now consider that all risk might be obviated by a simple precaution, namely, to stop plucking for a sufficient time after the application—10 days would be enough —to make sure that the plucked leaf shall have developed since the date of the application. Spraying could therefore be done immediately after a field had been plucked. The actual leaves that will be taken at the next round will be still in bud at the time of this application, and will unfold in the usual interval. These leaves will be quite free from any trace of the poison.

The most convenient form of sprayer is the knapsack type, which can be easily worked by one man with a second man to feed it. If arsenate of lead is to be employed as a spraying mixture, it may be used at the rate of 1 lb. to 100 gallons of water. The poison should be first made into a thin paste, and the rest of the water added subsequently. The addition of powdered lime (in equal weight to amount of the arsenate) is said to prevent any injury to delicate foliage.

Moth traps of the following description will often destroy a large number of the winged insects. A small coconut oil lamp is placed in the middle of a large tin tray or basin containing water with a film of kerosine floating on the top. The moths are attracted by the light and fall into the water, where they are killed by the film of oil. This trap will be of nse only when the moths are on the wing. It will be fonnd more effective on dark still nights, and should be placed well away from any counter attraction in the shape of bungalow lights. It will be useless during moonlight, it being a well-established fact that few moths are on the wing at such times.

But the good old rule that "Prevention is better than cure" is particnlarly applicable in the treatment of insect pests. As has been shown above, plagues of caterpillars are subject to more or less regular fluctuation, increasing until a certain climax has been reached, and then practically disappearing for a term. This disappearance is not complete. There must always be a few individuals carrying on the breed; their increase checked for a time by causes that are only partly understood, such as climatic conditions, natural enemies, and parasitic diseases, &c. It should be our aim to assist these natural checks by keeping a look-out for and destroying any caterpillars that may be seen during what we may call the "off season." The pluckers should be instructed to always remove and crush any twisted or folded leaves observed on the trees, and if any of the larger species of caterpillars are seen the tree should be marked and the fact reported to the superintendent, who should most carefully search that and the immediately surrounding trees and destroy every individual caterpillar fonnd there. With plucking continued throughout the year, every single tea bush must pass under the hands of a cooly at intervals of about ten days, and if this system of observation is properly carried out it would seem almost impossible for any caterpillar pest of the tea plant to get out of hand. I cannot lay too much stress upon the importance of great attention throughout this off season or resting period, when the tea seems to be most free from attack. It is at such times that the planter is apt to be off his gnard.

When caterpillars have to be collected by hand, they may be conveniently destroyed by placing them in a mixture of phenyle and water (1 to 20).

The following species have at different times come under observation as serious caterpillar pests:—

*1. The "Pale Tea Tortrix," *Capua menciana* Wlk.

*2. The "Variegated Tea Tortrix," *Capua* (undetermined species).

3. The "Leaf Rollor," *Gracilaria theivora*, Wlsm.

4. The "Blue-striped Nettle grub," *Parasa leqida*, Cram.

5. The "Morowak korale Nettle grub," *Thosea recta*, Hampson.

6. The "Green Nettle-grub," *Thosea cana* Wlk.

7. The "Fringed Nettle-grub," *Natada nararia*, Moore.

8. The "Red Slug," *Heterusia cingala*, Moore.

9. The "Small Bagworm," *Manatha albiqes*, Moore.

10. The "Large Bagworm," *Clania variegata*, Snell.

11. The "Twig Caterpillar," *Boarmia bhurmitra*, Wlk.

No, 1.—The "Pale Tea Tortrix," *Capua menciana*, Wlk.

Eggs: not known. They are probably concealed at the base of the buds of the plant.

Caterpillar: dull green or greenish white, with a shining black head and a black horny patch on the back of the second segment. There are about 12 minute tubercles on each division of the body, from each of which springs a fine bristle. When full-grown the caterpillar is about ¾ inch long.

The larval stage occupies about a fortnight, after which the caterpillar fastens two leaves firmly together and turns to a dark mahogany-coloured chrysalis.

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* Since the above was written and set up in print, specimens of Tea Tortrix have been kindly examined by Mr. J. Hartley Durrant, F.E.S., who reports that the supposed new species is not really distinct from No. 1: and that both these species should be referred to an earlier name,—*Capua coffearia* Nietner.

The moth usually appears in from seven to ten days' time, though one of my correspondents tells me that he has known twenty days to elapse before its emergence. It is an inconspicuous insect. The fore-wings of a pale reddish-ochraous colour, with some indefinite diagonal lines The hindwings straw-coloured, without markings. The expanded wings of the female measure nearly one inch. The male is somewhat smaller and of a darker tint. When at rest the wings are folded so that their outline is like that of the section of a bell.

The caterpillar of the Tea Tortrix makes itself obnoxious by its habit of spinning two or three tea leaves together and feeding upon the enclosed parts. When the pest is at its worst, the leaf may be destroyed over whole fields of tea, resulting in a very serious loss of flush. This species attracted notice ten years ago, and was reported, at intervals, from different parts of Dikoya and Dimbula.

More recently a distinct species has come into prominence in the same districts.* It may be called—

No. 2—THE "VARIEGATED TEA TORTRIX," *Capua* sp.

The carterpillar is scarcely distinguishable from that of No. 1. It is of the same pale-green colour, but the dark horny patch on the second segment is larger extending over the sides as well as the back of that segment.

The difference is more apparent in the moth, which is considerably smaller than that of *Capua menicana* being little more than half the size of the latter. It is of a brownish colour, with a blackish spot at the middle of the front (costal) edge of the wing, a curved reddish-brown patch across the middle of the wing, and a similarly coloured patch across the extreme tip. There is a very prominent tuft of scales which projects on each side from the base of the wings when they are folded.

From correspondence received, the pest seems to be most in evidence during the period from October to the following April. It is noticeable that the worst attacks are reported in alternate months, viz., October December, February, and April. I do not find that the amount of rainfall has any very marked effect upon the prevalence of the pest. Returns from an estate in Dikoya show that there was a very bad attack in October, a wet month, during which 23.73 inches of rain fell on 24 days. The previous month had also been wet, 13·78 inches falling on 19 days. The next bad attack was in the first half of December, with only 5 wet days, after a comparatively dry November.

A report from Pundalu-oya notices a severe attack in February-March, both dry months, following a dry January. On this occasion the pest was said to disappear with the April showers.

It would appear that the caterpillars are not directly affected by the weather, though they may be indirectly so. For when—as often occurs at the climax of the plague—an epidemic attacks them, the moist atmosphere during rainy weather will be most favourable to the rapid growth of the disease. And this I have repeatedly found to be the case.

The districts chiefly affected by this particular pest are Dikoya, Dimbula, Pundalu-oya, and Ambagamuwa. The following quotations from correspondence will give a good idea of the destructive habits of the insect:—

"Dikoya, 17th December, 1899.—The fields attacked are generally three to six months after pruning, just when the very best flushes are coming on......... I collected in cooty sacks the eaten leaves and burnt and buried them, often burning 400 to 500 lb. a round ....On Friday last I had 80 pluckers, and we did 20 to 25 acres, and collected and buried 500 lb of this leaf. It is a great loss and delays all the work, besides the extra expense in collecting and burying. We have had these visitations before, but I have never seen it so bad as it has been this year, and it materially reduces the yield. I pluck regularly so as to try to keep ahead of the caterpillar, but so far have not succeeded in keeping it under."

* See foot-note on page 372.

"Hatton, 3rd February, 1900.—Period from brood to brood of the carterpillar pest: three months. Duration of chrysalis stage: 20 to 21 days. [This is an unusual length of time; in my breeding cages moths appeared after 8 days,—E.E.G.]......... The pest does not seem to be much affected by weather, as the caterpillar glues leaves together with silk, and so is not much washed by rain. It prefers a sunny slope, and is not so marked where tea is exposed,"

"Pundalu-oya; 7th May.—I always notice that after the first spell of wet weather the caterpillars seem to die off. This season the attack began in December, earlier than usual, owing to failure of north-east monsoon rains, I had the caterpillars on surface of bushes thoroughly removed every 8 days when field was plucked, but it was impossible to get all those in centre destroyed: coolies could not see them, nor could I. The effects, however, were manifested later on by the riddled appearance of bushes.........Here the Tortrix only attacks tea 9 to 12 months after pruning, just when it should be flushing its hardest, I calculate I have lost from 30 to 50 lb. made tea per acre on the 50-acre field attacked this season,"

It is evident, from the above correspondence, that when once the pest has reached the destructive stage, it is practically impossible to keep it under by hand-picking alone. It will run its course and die off from natural causes after reaching its climax. But I must again repeat that by proper attention during the off-season the pest may be prevented from getting ahead. When it has become widely established the most likely means of checking its course would be to spray the trees—as suggested above—with arseuate of lead, Paris green, or some similar poison, immediately after a round of plucking, the bushes being then allowed to run for from 10 to 12 days before next plucking. The leaf then plucked will have developed since the application and will be quite free from the poison. In the meantime—if the work has been thorough—most of the caterpillars should have died from eating the poisoned foliage.

No. 3.—THE "LEAF ROLLER," *Gracilaria theivora* Wlsm.

Egg: deposited singly on the under surface of the leaf.

Caterpillar: pale yellow or greenish, with an indistinct darker line along the middle of the back. A few short colourless bristles scattered over the body. Length about three-eighths of an inch.

Moth: fore-wings dark purple-brown, shining with iridescent tints and crossed by a triangular yellow patch; hind-wings dull black; front of head bright yellow; thorax purple brown; abdomen black above yellow beneath.

The life-history of the insect is interesting. The following description is extracted from my early work on "Insect Pests of the Tea plant" (p. 62):—

"The egg is deposited by the parent moth on the under side of the leaf. As soon as it is hatched the young caterpillar burrows into the tissue of the leaf and passes its early life as a leaf-miner. Its track is visible on the under side only, and always terminates on a small pocket formed by folding over a portion of the edge of the leaf. In this recess the caterpillar sheds its skin, after which it deserts the burrow and takes to the leaf-rolling business. If the leaf in which it has been mining is still tender enough for its purpose, it sets to work on the spot; but should this leaf be too old and hard the caterpillar will travel along the shoot to the nearest soft one and roll it up from the tip to about the middle, fastening the sides together with silk. Within this shelter the insect passes the remainder of its larval period, feeding upon the inner folds of the leaf. Sometimes two or more of the larvæ live together, but usually each roll is occupied by a single tenant. When about to change into a chrysalis, the caterpillar spins a flat silken cocoon in a shallow depression on the leaf. After about two

weeks the moth appears. In this stage it may be observed running about upon the tea leaves, or resting with the head and anterior parts erected and the body supported by the first two pairs of legs only, the other legs and the antennæ being closely folded along the body. Several species of Ichneumon wasps prey upon the caterpillar. In wet weather many of the caterpillars are drowned by the water that accumulates in the cavities of the rolled-up leaves."

This insect does not often assume the importance of a pest, though it is always present in moderate quantities. But I have on more than one occasion received notice of rather serious attacks from the Badulla, Bandarawela, and Udapussellawa Districts. I quote from a recent letter giving particulars of one of these attacks:—

"Bandarawela, 6th January, 1900.—The leaf-roller was prevalent here last season to a marked degree. It seems to appear on the arrival of the north-east monsoon. The injury became very noticeable about January. Every affected leaf was plucked off—as advised—and I found by about the end of February that the pest had disappeared, partly owing to my having pulled off the rolled leaf and partly owing to the grub being drowned by the rain. On the setting in of the last north-east monsoon I noticed the caterpillar again starting work. I immediately gave to each of the pluckers a cooty sack to contain all the rolled leaves, which they were instructed to take off. I am pleased to say the estate is now practically free. I notice that the grub makes specially for young leaf on young tea. Into the older tea it has made very little incursion."

For this pest hand-plucking is the only practical remedy. The caterpillar is too well protected to be reached by any insecticide. The fact that in rainy weather it becomes drowned in its retreat suggests that a plentiful spraying with plain water might bring about the same happy result, but such spraying would have to be repeated many times to produce anything approaching the conditions of a rainy season.

"Nettle-grub" is a popular term applied to a certain family of caterpillars provided with tufts of stinging hairs. When the caterpillars are accidentally or carelessly handled the sharp points of these hairs enter the skin, break off, and at the same time some of the highly irritant fluid that occupies the swollen base of the hair is expressed into the wound. This action has its advantages as well as its disadvantages from our point of view. The coolies, when plucking the tea bushes, will become quickly apprised of the presence of the caterpillars: the spot can be marked, a careful search made at once, and the brood exterminated before it spreads. Four separate species of these "Nettle-grubs," have attracted attention as pests within recent years.

No. 4.—The "Blue-striped Nettle-grub," *Parasa lepida*, Cram.

Eggs: laid in clusters of from 15 to 20, closely overlapping each other like the scales of a fish, which they resemble also in their flattened oval shape. They are almost transparent; the embryo can be seen through the shell.

Caterpillar, broad and comparatively short; rounded in front and behind: bright yellow-green, with a rich lilac stripe along the middle of the back and a bright blue stripe on each side, each stripe bordered by a darker line of the same tint. The poisonous spines are arranged in tufts along the body; they are pale green, four tufts near the head and another pair near the tail tipped with scarlet; there are four large black spots at the hinder end of the body. Specimens that have been feeding upon tea are much more brightly coloured than those that have been reared upon coffee leaves. The latter are ornamented with green stripes and spines upon a pale greenish ground. They might easily be mistaken for a distinct species. The legs of these caterpillars are rudimentary.

Cocoon, hemispherical, dark brown, closely resembling the tea stems upon which it is usually placed; thin, but very compact. The chrysalis is contained in this cocoon.

In from four to five weeks the moth makes its appearence, escaping from the cocoon by a lid-like opening at one end. It is a pretty insect; the forewings chocolate brown with a broad emerald green band stretching obliquely across them; the hindwings buff, tinged with chocolate at the margins; front and sides of the thorax emerald green: and a small spot of the same colour at the base of the two front legs.

The caterpillars are gregarious, and are sometimes present in such large numbers as to completely defoliate the trees upon which they are feeding. A neighbour who sent me specimens told me that more than fifty of them had been removed from two adjacent tea bushes. In another instance, a group of four or five trees were left quite bare, and the superintendent, searching for the cause of the mischief, received practical demonstration of the stinging properties of the caterpillars.

I have had no recent complaints of damage from this species. It usually confines its attacks to a few trees only. The grubs when found should be removed and destroyed, but under the circumstances some other method than handpicking will be found advisable.—*Royal Botanic Gardens.*

(To be concluded.)

GREEN TEA—HOW TO MAKE IT.

I have read with interest the various letters that have appeared in your columns lately on the above subject, and, being an old green-tea maker myself, a few words of advice from me might be of use to those intending to try their hands at it. In my opinion, there is no necessity to make the slightest alteration in existing machinery, or in any way add to it; nothing could be better than a sirocco at a rather high temperature for withering the leaf. Treated in this way the leaf is in a far better condition for rolling than steamed leaf, and will keep for hours in the wet state without showing the least sign of fermenting.

There is no reason why every planter, when he finds himself blocked with leaf in very wet weather, as often happens (and, *is one of the chief causes of poor quality owing to an imperfect wither leaf being kept too long)*, should not turn some of the leaf into green tea, and thus get rid of the excess and make better black teas of the balance. But, though this would be very convenient and useful to many during the worst months of the monsoon, it would never do to depend on it entirely for all the green tea we want to make.

We wish to capture a market already occupied by China and Japan, and to do this we must make tea that will equal theirs in appearence, as well as beat it in purity and strengh, and, to do this, we must alter our system of plucking and pruning. Anyone wishing to make green tea should set apart a portion of his estate to be treated exclusively for green tea and in doing this it is well to remember that the large leaf indigenous is not so well suited for green tea as the China or (so called) low-class hybrid jat. Most of the older estates in Ceylon have fields of this class, and these are the fields that should be chiefly devoted to green tea.

In plucking for green tea, the Chinese never pluck the shoot with the stalk, as we do for black tea. They take the tip and then the leaves, the stems being left on the bushes. *They do this even for their finest quality black teas, and, if we did the same, we should doubtless get better prices and there would be no need to make green tea at all, as this system of plucking would in itself reduce the yield fully 20 per cent.*

But, though this would be a very simple way out of the difficulty of over-production, planters are not likely to adopt it on a large scale, yet for green

tea it is *necessary*, as it is practically impossible to get a twist on such wet leaf. If the leaves are attached to the stem, many of these shoots will be found to have rolled into a big ball without separating at all; but the system of plucking as described ab ve renders more frequent pruning necessary, though of course, not so heavy as is usually done in Ceylon. This reminds me to say that I firmly believe this heavy pruning is at the bottom of all our troubles. We hack our bushes down in a most unmerciful manner, in order to make them run 18 or 20 months (*hacking is the only word for it—we can't call it pruning*); and the result is we have to wait 6 or 7 weeks before we can begin plucking; and then, for the next two months or more, we get leaf that is *utterly useless* for making tea, and if shipped by itself, would barely realise enough to cover costs. This is the leaf that should be destroyed if any, but what I say is DON'T GROW IT.

By pruning lightly every year, we should avoid all this useless rubbish, and I don't think we should lose anything in quantity, as a lightly pruned bush is ready for plucking in about a month, and begins at once to give big and regular flushes, whereas a heavily pruned bush not only takes longer, but after all the pruning shoots have been gathered, it takes a rest for another month or so before it begins to yield big and regular flushes; so that, in the one case there is a loss of two-and-half to three months as compared with a loss of only one month. Heavy pruning is necessary only once in five or six years.

I am glad to see that the Indian planters have at last made up their minds to do something to relieve the London market; but, even now they don't seem to have hit upon the right way—which is to capture the local market. I had some experience of that years ago, when I was myself an Indian planter, and I am positive, from what I saw and heard then, that, if the planters would set about in the right way to introduce their tea to the native community, 50,000,000 lbs. would not suffice to supply the demand that would soon spring up. Can't we manage to persuade them to do this?—OLD CHA. in *The Times of Ceylon.*

TROPICAL PRODUCTS.

A Demerara paper of recent date contains the following relative to cultivation of tropical products as pertinent here in these islands as there.

Persons unacquainted with the past history of the colony are continually asking "Why don't you grow coffee?" or why not cultivate fifty other things? They hand you a long list, including cotton, cacao, rice, spices, and even ground nuts, without thinking of the local conditions of the countries in which these articles are already grown, and of the possibility of overstocking the market. Calculations are often made showing that a certain product will pay at the present price, but no thought is given to the probable effect of increased production.

Sugar is a food, and as such its possibilities of consumption are greater than perhaps any other food products, except the different kinds of grain or corn. Rice may be put down as the best grain for this colony, but no one who has thought over the difficulty of turning a sugar estate into a rice plantation, and then of putting the product into competition with that from the East Indies, can come to any but an adverse conclusion. With other foods there will always be the possibility of over-production, and that very quickly. Indian corn and cassava can be grown here to advantage, but in the case of the first we should have to compete with the United States, and the second with Brazil. There is no probability of any very great increase in the consumption of cassava starch, farina or tapioca, and maize is so cheap that it is out of the question. Plantain flour might be useful, but unfortunately there is no market for it in quantity at present.

The story of sugar cultivation in the colony is an interesting one. It was commenced by the West India Company about two centuries ago in the neighbourhood of Kyk-over-al, from where it gradually extended down the Essequebo and into the Demerara But, although commenced in the upper districts, it was never anything of a success until the coast lands were taken up. The experience of the early settlers agreed with the late deductions of the Government analyst, that the river banks beyond the alluvium were barren, and hardly worth cultivating after two or three crops had been taken off. Only the high price of sugar once made it possible to carry on the cultivation by clearing new land as the old gave out. When it was discovered that on the lower banks and coasts this was unnecessary, the die was virtually cast which made British Guiana a sugar colony. Nevertheless the final decision was not come to all at once. Even then a sugar plantation required a large supply of labor, and many a poor man with but a few slaves found it suited his pocket to grow cotton and coffee, which then fetched what we should now consider magnificent prices.

Coffee was introduced into Essequebo in 1725 but at first it was a failure. The comparatively barren soil in the neighborhood of Kyk-over-al did not suit it, and then again the trouble of picking and preparing the berries was against it. So great was the failure that, although 24 bags were shipped in 1728, a few years after the Commandeur had to get a supply for his own table from Surinam or Berbice. In the last colony coffee cultivation was more successful. It was introduced from Surinam in 1720, and soon became of so much importance that Berbice coffee was well known in the markets of Europe down to the emancipation. After Demerara had become settled coffee came to the front and took its place besides sugar. In the year 1745, when the first land grants in the Demerara river were made, only one bag of coffee was shipped from Essequebo, but from that time the export increased until it reached in the early years of this century about ten million pounds annually from Demerara, besides nearly seven millions from Berbice. Java, in No. 1 Canal, seems to have been the principal coffee estate in Demerara, and Anna Clementia the most important in Berbice, the latter producing 530,525 pounds in 1811.

Besides the high prices of coffee and cotton, there were other factors which helped to prevent losses on their cultivation. Slave labor was reliable—there could be no strikes, nor was Saint Monday observed anywhere. Then again the estate owners worked together. "You scratch my back, and I'll scratch your back" was in effect their motto. One lent his gang for picking, and in return similar help was given when required. Coffee picking was no doubt tiresome, although by no means laborious, still it had to be done, and done at the right time. It is generally considered that coffee came to grief on account of the emancipation, but this was not altogether the case. A time came when sugar and coffee were equal in price, or when advantages of the the former were so great that, with a small labor supply, it would be foolish to keep up a plantation of of the lower priced product.

Although cotton was one of the articles brought from Guiana by the first traders, who brought it from the Indians, it was not cultivated to any extent until the middle of the last century. In 1762 the produce of Demerara and Essequebo amounted to only ten bales, and it was not until the surrender to Great Britain in 1796 that anything like a "boom" took place. Then the three rivers were really opened, free grants of land were made, with the result that the whole coast from the Essequebo to the Corentyne, and even across to Nickerie, was a succession of cotton fields. Virgin soil, impregnated with salt, produced good crops, which sold at what would now be considered fabulous prices. The exports soon reached to over seven million pounds, and there seem to have been

prospects before the cotton planters. But very soon after the abolition of the slave trade, the Southern States increased their cultivation, and not being hampered by so many obstructions to their labor supply, the staple came down to a price which did not pay. Ruin was almost universal in Berbice, and Demerara was little better.

Only sugar was left when coffee and cotton fell; it was the survival of the fitt st. Can we say today that there is the least chance of success with any other product? But, if there is hope, will it not be for a new body of men in new districts? Such being the indications, what a sad thing it would be for the colony if the coast plantations were ruined. When cotton fell, coffee and sugar were left. When coffee fell, sugar was left. If sugar falls, what then?

SOIL AND NATURAL FERTILITY.

A Rock is never a very simple agglomeration of chemical combinations, but the overlying soil—the dark, humus-stained, bacteria- riddled, worm-gathered, semi-organic mass—is a much more highly complex problem alike for the scientist and practical farmer. The former has to say how rocks can best be rendered into fertile soils, and the latter has to carry the work into practice. The soils of rocks may be roughly classed.

1.—The granitic soils are generally poor in phosphoric acid and destitute of lime.

2.—Clay soils are compact and tenacious, poor in phosphoric acid, but rich in potash.

3.—The liassic soils are remarkably rich in phosphoric acid and potash.

4.—The calcareous soils are very fertile, but less tenacious than the preceding.

5.—Ferruginous clays and sands are very poor soils, extremely deficient in lime and phosphoric acid.

When fertility is merely considered, and the most practical way of gaining it in a given time, the soil problems go far beyond any geological or chemical formulæ we can express our thoughts in as yet. They cannot take into account the vital action of millions of bacteria, or of the ground borers from the mole to the smallest grub. Every borer great or small, opens the ground and lets in the air, and the oxygen and nitrogen in their freely mixed state in the atmosphere have each a work to do in soil fertility. It is little use telling the practical agriculturist that nitrogen is not taken into combination directly in a bare fallow. What is going on below the ground while the soil is kept free from vegetation above? he demands, and is ready with a score of pointed questions at once. Why does soil grow richer and richer in proportion as it lies unused? Why does nitrogen gradually accumulate under permanent grass? Why does earth taken from a rich pea-growing soil, and lightly dusted over field sown with peas, produce a much heavier crop on the dressed portion? If the peas themselves are steeped for some time in a solution made by a rich pea soil and water, why do the plants grow more vigorously than those that have been sown undressed?

The nitrogen-fixing bacteria are everywhere, but in grass land more than in tilth, and where yard manure or cattle droppings are plentiful they are soon doing their beneficent work, aided by a free flow of moisture and air. Strange though it may seem to the ordinary agriculturist, the soil which seems to him such a solid thing is little more than an open sieve for admitting air and water. Grass, and good grass, too, can grow in "living water," it is the stagnant pool of cold water choked with carbonic acid gas and marsh gas, which prevents vegetation by excluding oxygen. Fresh water flows away into the earth drawing air after it, no small portion being entangled in it mechanically as well as absorbed. There cannot be a flow of water without a corresponding flow and inrush of air, and the soil requires both equally to reach the highest fertility. The nitrates, which gradually accumulating in the ground would destroy the activity of bacterial life, are washed away, while carbonic acid gas is forced downwards to escape by the under-drains, which are especially valuable in carrying it off, and therefore should only be sunk at a reasonable depth in retentive clay land. Few men, indeed, even when geologists and chemists, appreciate fully the action of rain and air together as makers of fertility. Bacteria cannot work without moisture, and the all-important nitrifying bacteria cannot work without a changing inflow of moisture and air. The soil, from its open state and sieve-like capacity, provides both conditions in ordinary seasons. The finding of good flows of water when wells are sunk, speaks with the clearest voice to those who can understand about the double aeration of the soil, caused by every shower, from the air it drives before it and draws after in its train. No wonder, then, that a heavy thunderstorm will make the burnt-up pastures a lovely emerald green in the driest seasons. The bacteria had been working in the warm soil till the want of moisture and accumulation of nitrates prevented further vital action. Then came the time of short brown grass, which "burned" more and more each day of brilliant sunshine. Broken weather and heavy rains dissolve the poisoning nitrates, feed plants with their rich store of food, and set the bacteria free to work by soaking everything with fecundating moisture and pure, cool air, which it brought entangled with it or in its train. The plants feed on the waste products of bacterial life, and the bacteria are busy purifying the soil by consuming all dead animal and plant substances, bringing them slowly into suspension and solution, ready for nitrification; fitting them for beginning the round of the life cycle once again. It is not much the presence of air in the soil as the presence of pure water and air together that makes a soil naturally fertile; and when the water is from the clouds it comes in the best shape, whether it be fluid or snow. Let those who find artificial manures cheap and paying use them as long as they will, or the soil will allow of it; but a good supply of organic matter in the soil seems to be nature's way of obtaining a growing fertility. The best manure yet made is that which the farm supplies through the bodies of its stock when fed on rich food. It is a good substitute for the work of the forest in making constant additions of organic matter to the soil. If a uniform and steady growth in quality is the thing aimed at, there seems no other way in obtaining it, when the soil is a sufficiently rich loam to retain a store of plant food. There are sands so sieve-like and clays so stiff, that in one case the water washes everything away, and in the other it cannot enter to do its work at all. A stiff clay may grow good grass in time with care, but a barren sand is past praying for; if you add clay and lime in the right proportions to make it fairly good, you are buying your land a second time over for self or landlord, and can never hope for a return in on the outlay. "It never pays to make land where it can be bought ready in the neighbourhood. Give me a clay, or loam lying on the clay, the richer the better, and I will try to make the thing go; but a barren sand will hold nothing." It would be impossible for most of us in Jamaica to get enough animal manure of this kind. In the north where there are large cities where fat stock is in great and constant demand for the butcher, it pays farmers to stable or yard their stock and feed them by hand on highly concentrated nitrogenous food, such as cotton seed meal, mixed with more bulky foods like hay, and save the manure, which is very rich in fertilizing elements, to apply to their fields; thus a double object is gained and there is no waste; the added weight of the cattle by the consumption of rich food pays the feeder, and the refuse saves the purchase of fertilizers. What we must do, is to add potassic and phosphatic artificial fertilizers to our

soils (for neither is it possible to get a sufficiency of wood ashes to serve the same purpose) and grow leguminous crops, even if it should only be cowitch; when such crops of peas and beans are so fertilized with potash and phosphates the bulk vegetation and the crop of seeds are both very large; enough seeds may be saved for future crops, and if chosen, some may be marketed if it is found to pay well enough to pick, shell, and cure; and the decaying leaves, stems and roots should then be broken up and mixed with the soil with fork or plough. This is copying nature's methods of conserving the fertility of the soil. The grass sod is constantly withering away and new grass springs up and the old; when this goes on for many years there is a continuous addition of decaying vegetation forming a deeper and deeper layer of loam. In the forest the leaves and twigs drop season after season; then trees get old, rot and crumble away, so that there is a constant addition of decaying vegetation covering the soil below where the roots are, and while the rain washes the fertilizing gases down, the rootlets strike upward eager to seize and absorb them. But nature works slowly, if surely, while man is impatient. So by planting peas and beans, which grow quickly and feed partly on the air, absorbing the atmospheric nitrogen through their leaves, pumping it down into the soil through their roots and developing profuse vegetation, the roots at the same time searching out and drawing up from the subsoil stores of potash which otherwise would have been locked up and unavailable to the principal crops, bananas or sugar cane, or whatever the crop may be, we can in three or four months, or at any rate twice a year, turn as much decaying vegetable matter rich in nitrogen and potash into the soil as nature might not do in many years in a forest. —*The Journal of the Jamaica Agricultural Society.*

IRRIGATED COFFEE.

Mr. C. Meenacshayya writes:—Will you kindly permit me to supplement by a few words the letter which you published about irrigated coffee. Most planters might have heard of the enormously large operations carried on by Messrs. Finlay, Muir and Co. in Travancore, in planting tea and coffee. One of their Chief Superintendents, Mr. William Milne, under telegraphic instructions from Calcutta, paid a visit to my plantation here on the 31st December, 1897, when my oldest plants were only two years old, plants which are now giving me about 7 cwts. crop. He was highly pleased, and told me that he was going to report very favourably. Under the impression that that Company might go in for irrigation coffee on a large scale in this Province, I mentioned the matter to the Dewan, Sir Seshadri Iyer, and he was so delighted with the prospect of that wealthy Company starting operations in this State, that he asked me to write to Mr. Milne giving assurance of every encouragement from the Durbar. I wrote to him accordingly, but I ascertained that the object of the visit was to see how far, if considered desirable, they might adapt their coffee-growing to a system of irrigation in Travancore. Mr. Brown, of the Cubbon, Bangalore, has a small plantation near Kengeri and he pumps up water from a perennial rivulet that runs below. I am not in a position to say what margin of profit can be attained if a small plantation is so expensively irrigated. There is a very large estate near Lavarakeri, about 15 miles from Bangalore, where arrangements are made for pumping water, also from a perennial stream, to fill up tanks; but I understand that the object is to grow mostly paddy and sugar-cane, though there is some coffee. A never-failing tank such as Berankenave or Marikanave will be the cheapest source of water-supply. I would recommend the formation of a Joint Stock Company amongst the planters, to raise a plantation on a large scale, say 500 or 1,000 acres under one of these tanks; the Durbar might be appealed to for granting land under special concessions. That acquired, the rest is plain sailing for which a small outlay will be adequate. Famine-years, as a rule, need not affect irrigated coffee. Famines occur, generally, not by a total failure of or a great deficiency in the rainfall of the year, but by unseasonable rains, when the dry crops, which are the staple food of the ryots, die out for want of seasonable rains; no amount of deluging afterwards could resuscitate them. A big deep tank, with a large catchment area, when once filled (it matters not in what particular month from June to January) will serve your plantation during the dry months.—*M. Mail.*

PLANTING NOTES.

CANADIAN FRUIT EXPORT.—We learn from the *Canadian Horticulturist* for October that a cold storage car for use on the Grand Trunk Railway, and special cold storage compartments of the same kind on board the steamers, have been prepared in place of the unsatisfactory appliances hitherto in use. Manchester will be the port to which the first shipments will be made, and should the results prove equal to expectations, other lines will be fitted up.—*Gardeners Chronicle*

SERVIAN PLUMS.—From Belgrade we learn that during the present year, dried Plums to the value of 6,000,000 francs have been exported from Servia, and Plum jam to the value of 2,400,000 francs. In the year 1890, dried Plums were exported to the value of 7,300,000 francs, and jam to the extent of 1,300,000 francs. In addition to all this, considerable quantities of fresh Plums for use as table fruit, or for the manufacture of spirits, are exported each year. A considerable trade at one time existed with this country in dried Plums, but that has been swept away by exports from France and California of fruits which have undergone a double drying process.—*Gardeners' Chronicle.*

CONIFERS AS RAIN GAUGES.—According to a recent number of the *Revue Horticole*, M. Felix Sahut has lately communicated to the Congres des Societes Savantes observations respecting certain plants that act as registering rain gauges. "Mention has already been made of the influence of certain more or less severe droughts in the French Mediterranean upon Pinus Laricio of Corsica, and Cephalonian Fir. The lengthening of the branches of these two species is always proportionate to the quantity of rain falling during those months of the year when it is most profitable to them. Co-efficients have been established indicating what the degree is for each month of the year. These co-efficients enable the relationship that exists between the amount of rain fallen, and the greater or less intensity of the vegetation which it has encouraged to be determined. It is shown that, under these conditions, it is possible to judge approximately the quantity of rain which has fallen by measuring exactly the length of the leader, or of the branch produced yearly on these species of Pine, and if the estimate is not absolutely proportionate to the quantity of rain registered by the rain-gauge, it closely approaches to it; and a still closer estimation may be made by taking into account the relative value of the results produced by rain in the several months of the year. It is, therefore, possible, to a certain extent, to use plants specially selected for this purpose as actual registering rain-gauges."—*Revue Horticole.*

NEW COFFEE SEED FOR B. C. AFRICA.

Mr. Balfour Blair moved a resolution regarding the necessity of getting new Coffee seed for the country. Seconded and carried. The resolution was on the following lines:—

This General Meeting of the B. C. A. Chamber of Agriculture and Commerce is unanimously of opinion that the Coffee seed should be imported into the Protectorate by H. M. Administration for the following reasons:

(1 The present seed has manifestly deteriorated owing to continuous in breeding. Since the first Coffee plant was brought to the Protectorate from the Royal Botanic Gardens, Edinburgh, there have been very few importations of fresh seed and most of the importations which were made were not greatly successful so that nearly all the plants in the Protectorate are from one plant and, as must infallibly happen in such cases, the stamina is steadily deteriorating and cannot be improved without the introduction of a new vigorous strain.

(2) In consequence of this large amount of in-breeding and the failure of stamina there is very grave risk of new fungoid and scale diseases breaking out the poorer fields, or, should any disease be accidentally imported the recent plants would have no strong existing power and would succumb readily to any pest which, in the present circumstances, would mean the ruin of the Coffee industry.

(3) The deterioration of the present seed is noticeable in the number of weak seedlings which are produced from the seed; in the failure to throw sound berry even in maiden crops; and in the failure of whole districts and estates to produce good and sound crops. These failures are attributed by many experienced planters to the deterioration of the seed.

(4) Owing to the very strict Regulations against the introduction of seed from countries invested with *Hemileia vastatrix,* it has been impossible for Planters to import seed from nine-tenths of the Coffee producing countries of the world and those countries which from their proximity to this Protectorate would be most suitable for seed purposes, such as India, Natal, etc., are absolutely debarred. This Chamber has always loyally supported H. M. Administration in the Leaf Disease Regulations, but they cannot fail to point out that these Regulations, act as a practical bar to the importation of new seed by private planters and hence our request that H. M. Administration should undertake this work. The few private importations which have taken place have mostly been from Jamaica and owing to the long distance and the delays incidental to private importation (owing to the Leaf Disease Regulations) these efforts have in many cases ended in failure as Coffee seed loses its vitality in less than six months. This Chamber is therefore of opinion that the importation could be undertaken most successfully by Government and they pledge themselves to bear any expense which might be incurred in introducing new seed.

(5) This Chamber would recommend that seed be imported by the Government direct from Jamaica (Blue Mountain Coffee), Trinidad, Brazil, Queensland, and any other places where H. M. Government find that there is no risk from Leaf Disease, such as the South Sea Islands some of which grow Coffee. They would suggest that such seed should be sent direct to Zomba by the quickest possible route and distributed to Planters in conformity with their indents for which the necessary deposit money has been paid.

(6) The Chamber recommend the above to the earnest consideration of H. M. Acting Commissioner as they are convinced that the matter is one of great importance and vital to the progress of the Coffee Planting industry of the Protectorate which is in danger of extinction unless new and vigorous seed is introduced at an early date as is done in other Coffee growing countries of the world.

PLANTING NOTES.

JAM FOR SOUTH AFRICA.—The Imperial Government has arranged to obtain from New South Wales, for the use of troops in South Africa, 300,000 lb. of Jam—peach and plum.—*Agricultural Gazette N. S. Wales.*

LIQUID MANURE FOR TOMATOES.—The following method of preparing liquid manure for tomatoes is recommended by a correspondent:—One peck of horse-droppings and half-peck of soot should be placed together in a bag, which should be sunk in any ordinary barrel with the head out. The barrel is then to be filled up with clean water, and the mixture may be used in the proportion of one to four of clear water until the soil about the plants is moist. This manure is suitable, not only for tomatoes, but for most other plants. In the case of tomatoes it would be an advantage to sprinkle a little of one of the cheaper forms of potash about the roots previously. Tomatoes do not require feeding with liquid or any other manure until the fruit is set and swelling freely. As the liquid is used, the barrel may be filled up with clear water, and after this has been done once or twice the bag may be stirred round with a stick or spade. In a small garden the manure will last for three or four months, but when it is evident that the liquid is getting weaker, the manure and soot must be renewed.—*Ibid.*

DRESSING FOR TENDER-SKINNED HORSES.—Horses with delicate skins are specially subject to saddle galls and sore shoulders, when worked to any extent in harness. Much may be done to render such animals less liable to injuries of this kind by the regular use of astringent applications calculated to harden the skin over their backs and shoulders. As dressings for this purpose, quite a number are employed by horse-owners in different parts of the country. One of the most popular, and also one of the most effective when properly prepared, is a home made decoction of oak bark. A brine made of common salt is also very extensively used, and usually with good results. Another excellent dressing, and one which is much easier to prepare than the oak-bark decoction, is a lotion consisting of 2 drachms each of alum and sulphuric acid in a quart of water. The parts which are liable to chafe should be freely sponged over with one of these dressings two or three times a day. After a time, skins so treated will harden, or toughen to such an extent as to give no further trouble.—Wattle bark broken up fine and stewed for several hours will make a good substitute for the oak-bark concoction. —*Exchange.*

CACAO INDUSTRY IN GRENADA.

Cacao growing is the staple industry in the interesting island of Grenada. Its prosperity for many years when other portions of the West Indies were in a depressed condition was entirely due to the successful cultivation of cacao trees. With the view of drawing attention to the desirability of making every effort to maintain the productiveness of cacao estates in Grenada, the following interesting notes, written by Mr. George Whitfield Smith in 1892, are reproduced :—

"It is pleasant to notice one of the few instances in Grenada of a Cacao estate where, as the result of a careful system of manuring and draining, the proprietor gets from only twelve acres of Cacao a return equal to what many others receive from three times that area. I refer to Good Hope Estate in this island, owned by the Rev. G. W. Branch. On the advice of His Excellency Sir Walter Hely-Hutchinson, I called one morning on the proprietor, and was most courteously shewn over the whole plantation. Both Mr. Branch and his son, Mr. George Branch, most willingly afforded me all the information in their power. Wishing to be as clear as possible, I shall endeavour to adhere as closely as I can to Mr. Mr. Branch's replies to my questions concerning the working of his estate.

' 'I have been the owner of the property for over twenty years. Good Hope contains 22 acres—eight acres of this are in canes and pasture. I estimate that the buildings, yard, and entrance occupy another two acres, so that my extent of Cacao cultivation cannot be much over 12 acres. I purchased the place for about £100; at that time it had a few neglected Cacao trees here and there. Many people ridiculed my attempt to grow Cacao there, as the land was considered by most persons as almost valnless for that purpose. However, be that as it may, I could easily borrow £2,000 to-day on its security if I wished to do so. My soil is rather poor for Cacao when compared with many other places; as you will see, in many places there is a bed of "tuff" not far from the surface, and you know, when the tap root of a Cacao tree touches this, there is an end of the whole matter.

'How, then, do you account for the flourishing state of your trees, when, to judge from their size the tap roots must long since have come into contact with this layer of "tuff"?'

'My Cacao trees have no need so drive their tap roots very deep, as I will shew you when we are going through the orchard The Cacao tree is naturally a deep rooter, but if it can meet with its nourishment near the surface it will undoubtedly develop its feeding spongioles wherever that nourishment is, and that is what happens in the case of my trees.

'Please explain how you do this?'

'Willingly. My cacao orchards are, as you observe, on the slope of a hill, skirting the sides; therefore, among the trees, I have roads cut by simply digging down the slope to a level. These roads are sufficiently wide to admit the passage of a light donkey cart, and as they wind along the hillside in a corkscrew fashion you will understand how they serve a two-fold capacity. First, they act as roads proper, and, secondly they act as drains, since a small canal always skirts the upper edge for the whole of their length. Thus I have my Cacao field drained at regular intervals, and, in addition, my donkey cart can carry manure to any part of my estate.'

'How do you apply your manure?'

'Very simply: I just have the cart filled, and the driver upsets it at regular distances over the lower edge of these roads. I then go round as I can find time and bury this in. I likewise collect all leaves and bush from time to time, and bury these also. You will now see the effects of my system. Look down on the ground what you are walking on is not pure earth. Take up a handful of it. You will notice that it is a dense mass of fine rootlets or spongioles! These have been called into being from the amount of nourishing material which they find here ready for them, and have no need to go deep in search of food,

My system has converted the trees into surface feeders, and provided I keep them supplied with food I can fairly be said to have them well under control. Now, without manure the case is different; the tree has to push its tap-root deeper and deeper every year, in search of food, often it strikes "tuff" or "clay" then death ensues. Even when this does not happen, it stands to reason that a tree with a single tap-root supplied with a few scanty and half-starved rootlets, is in a poor way when compared with my healthy and vigorous trees which have an abundance of young roots, all eagerly sucking up the plant food around them. The good effect of this is easily seen when comparing the returns I get with those of neighbouring planters.'

'What do you average as a return from your 12 acres of Cacao cultivation?'

'About 87 bags per annum. This would represent a trifle over seven bags to the acre.'

'The old trees which you found on the place 22 years ago must be very old by this time: do they still bear vigorously?'

'Yes' quite as well as the young ones, and they seem good for many years yet, thanks to my manure system.'

'What do you consider to be a good yield per tree in pods per annum?'

It would be difficult for me to answer this and indeed I have never kept a record. My trees practically never stop bearing, but my son counted 205 ripe pods on one of the trees besides green fruit and flowers. As you can see most of them have each several dozen ripe fruit, green fruit, and flowers on them at the same time, so that my crop may be said to be continuous.'

'Do you purpose extending your cultivation?'

'No; the remaining portion of my land is too muc swept by prevailing winds to be of any value for Cacao; besides, I find that it pays me better to keep a portion in cane cultivation or some other fodder, not from the profit to be derived from sugar, but because it enables me to feed my stock; without this I could get no manure, and without manure I could get no Cacao. look upon my stock, therefore, as part of my working capital. People here seem entirely to forget this. I very often hear them speaking of the hard work they are having to get their plantation "covered in" as they call it, but if they knew what I know, they would find it more to their interest to keep one-fifth of their plantation in pasture lands and fields of fodder plants, and to keep several heads of stock to fertilize the other four-fifths.'

'What system do you adopt in storing your manure?'

'The old Barbados system, which I have found to work so well. I have all my animals kept in a pen, a portion of which is covered to afford protection in heavy weather. In this pen they stay nearly all the time that they are not in use. Their excrement is consequently collected in one place. I regularly cover this over with cut bush and litter, and at intervals I spread a layer of mould over it, and recover with litter. The result is, that at the end of a few months I have a mass five feet thick of the richest fertilizing material that I know of, and one that for our generous soil needs little assistance from chemical manures. In addition to this I use a large quantity of sheep manure, which I collect in a similar manner from my sheep farm at Point Saline.?

'Do you ever transplant your trees?'

'Often: and here, again, the beneficial effects of my system become apparent. I take up large trees with pods on them. There is no danger. not being deep feeders, they give little trouble. When a gap occurs through the death of a tree I fill it up as soon as possible.'

'What do you do in the way of pruning?

'I go through regularly and often, and break off all young shoots, and cut out any dead wood. You will see that my trees are perfectly clean of vines and lichens. A tree can't be healthy that has the pores of its bark stopped with roots of parasiticial plants.'

'What is your opinion about shade?'

'I find in my locality that shade is beneficial in the growing stage, but is inimical when the tree commences bearing, at least heavy shade is. This holds good with even the "Criollo" Cacao, of which, as you see, I have a large number. With me this is one of the hardiest varieties, and bears profusely. My trees have crossed with each other and now I have a great number of varieties shading off one into the other.'

'Do you use any care in selecting seed?'

'At first I was anxious to get my land planted up, so raised whatever seed I could get. Now, I select and replace a bad variety with a good one whenever opportunity offers.'

Do you grow other products with your young Cacao?

Always; such crops as yams, tannias, cassava, and canes come well with young Cacao, and, in my opinion rather do it good than otherwise, besides yielding catch crops of considerable value.'

What processs do you adopt in picking and curing? Do you separate the different varieties before sweating?

'With a small cultivation like mine it would be difficult to get a sufficient quantity of Criollo or any other variety at any one time to set up separate sweating boxes. I see the advantages of it, and regret that I cannot do so. My last account sales, however, are very satisfactory, and shew a receipt of 72 shilling per cwt., which, taking all things into consideration, is very fair indeed. The process of curing is that generally pursued in Grenada, and needs no special explanation."

More recently the following suggestions have been prepared by this Department with the view of assisting local efforts to maintain and improve the cultivation of cacao trees in grenada:

Commissioner of Agriculture—to Governor of Windwar Islands.

BARBADOS, 26th May, 1899

Sir,—I have the honour to forward for Your Excellency's information a Memorandum in duplicate prepared by this Department containing suggestion for renovating old and neglected cacao trees on the upper lands of Grenada.

2. During my recent visit to the island it was very forcibly impressed on my mind that, although the cultivation of cacao is steadily extending in the lowlands, the original areas planted in the mountains are gradually becoming unproductive. Hence it is that the exports of Grenada cacao have not increased in proportion to the area actually planted.

3. In the general welfare of the island it is desirable that the old cacao areas should receive special attention. Now prices are good is a favourable opportunity for doing so, and I would suggest that the subject be brought before the Grenada Agricultural Society with the view of eliciting the opinion of the members in regard to so important a matter.

4. It is possible that the Agricultural Society might assist small cultivators by affording information in regard to the best means for obtaining suitable manures at the lowest possible cost. It is desirable that all artificial manures supplied in the island should be sold under a guarantee that they contain the percentage of ingredients and the composition stated in the invoice. I would add that certified samples of imported manures forwarded to this office by the Government with a copy of the invoice would be analysed free of charge.

I have, etc.,

(Sgd.) D. MORRIS.

Commissioner of Agriculture for the West Indies.

MEMORANDUM on methods to restore old and neglected cacao trees on the upper lands of Grenada.

1. *Pruning.* All neglected and badly formed trees should in the first place be carefully pruned. This operation might be undertaken after the crop, possibly the months of February, March or April would suit for this work. Cut out all dead wood and unhealthy branches. The utmost care should be taken to make all cuts perfectly clean, and as close to the main limb as possible. Too much importance cannot be attached to this point, especially as it is a practice in the West Indies to leave a small stump, of an inch or two in length. Whenever this happens it will be noticed the stump dies and decay spreads into the heart of the tree. Always trim the edges of a cut with a sharp knife The ensures a more rapid healing of the wound.

In the case of specially old cacao trees, it would be a good plan to make use of a sucker, preferably one springing from a point near the root, and allow it to grow up in the place of a parent tree. The old stem should then be gradually removed. By adopting this method and by paying proper attention to tillage and draining it is quite possible to transform, in a short time, an apparently hopeless field of old cacao stems into a healthy bearing one.

In very extreme cases it may be necessary to remove the parent stem altogether. This should be done about 2 feet from the ground, and one of the suckers allowed to grow up as described above. Where the main stem is entirely taken away the cut should not be made horizontally across the grain of the wood, but in a sloping direction, say at an angle of 450. The former method is strongly to be condemned as it allows the accumulation of rain water in the wood, tending to rot the stem and destroy the suckers.

Lastly, it is advisable to dress all cuts with a mixture of coal tar and whale oil, in equal proportions. This not only encourages the formation of new tissues, but safeguards the wounds from the effects of rain and the attacks of the borer and other enemies of the cacao tree.

2. *Cleaning the trees.* By this is meant the removal of moss, "Capitaine du bois" (*Loranthus*), "Love vine" (*Cuscuta*), and any other of the numerous parasitical plants which infest neglected cacao trees on the upper lands. The best season for this operation is during March and April. Showery weather should be selected if possible, as at that time moss is easily removed, without the least injury to the bark of the tree. Blunt knives made of bamboo or preferably stiff fibre brushes should be used for the purpose. For removing "Capitaine du bois" all that is required is an ordinary cacao picking knife attached to a long stick of bamboo. Care must however be taken to completely remove the plant, as any portion of it left on the branch of a tree rapidly grows again. The removal of the "Love Vine" (*Cuscuta*) is a more tedious operation. The only way in which it can be dealt with is to employ boys to climb the trees and to remove every particle of the plant by hand. The smallest portion left on a tree rapidly grows again. When this pest once becomes thoroughly established in a cacao field, it is then a most expensive matter to eradicate it. Apparently the plant is spreading in Grenada and every effort should therefore be made to keep it in check.

3. *Forking.* With regard to the amount of forking required for a cacao tree, the opinions of planters vary considerably. While some planters claim to have obtained the best results from a system of deep forking and liberal root-pruning, others maintain that they prefer a light turning over or loosening of the soil with as little disturbance to the roots as possible. It is quite probable in the case of a perfectly healthy cacao tree with a well balanced head and a full supply of leafy branches, that any great disturbance of the root surface would not be beneficial. These conditions however do not apply to neglected cacao trees on the mountain slopes. Such trees, as a rule, have few branches; this indicates that they also have a correspondingly limited amount of roots. Deep forking and draining will be of immense value wherever this occurs. Care must be taken not to mutilate or break the large roots, as these serve to secure the upright

position of the tree in the soil. Any of the smaller roots which are unavoidably broken, during the operation of forking, should be cleanly cut back. New roots will spring from this point and continue to nourish the the tree.

Forking, by turning up soil, exposes it to the action of the sun and air. By this means the soil is loosened, the capacity for retaining air and moisture much increased, while at the same time the removal of excess of moisture is greatly facilitated. As a rule it will be noticed that the soil around the roots of old and neglected cacao trees is water-logged and unwholesome. No air can penetrate into it, and, as the roots can only develop when air is present, it follows therefore that the growth of healthy rootlets in such a soil is completely checked. It is also well known that chemical change can only take place in the presence of air. Such a change therefore is not only arrested, but injurious combinations arise which discourage or destroy the roots of plants. It is therefore evident that judicious forking increases the porosity of the soil. Its effect is further strengthened if all leaves and vegetable refuse are dug in at the same time. Vegetable refuse or humus performs a most necessary function in damp clay. It serves to keep the small particles of the soil farther apart, and it thereby permits the free admission of air, on which so many important changes and combinations depend. It is doubtful whether it would be found advisable to bury vegetable refuse in a green condition in damp mountain lands. A better plan would be to allow it to become withered for a few days before digging it in.

4. *Draining.* This naturally follows the operation of forking. When heavy rains fall on clay lands a certain quantity of the water is absorbed by the soil and the remainder either lies on the surface or is carried away by drains and streams. Some soils are extremely porous and rapidly part with their moisture after heavy rains. Clay soils, on the other hand, retain water for too long a time, and thus become old and sour. The only remedy for this is drainage.

It being established therefore that land is drained with the two-fold object of removing superfluous moisture and of promoting a free circulation of air, it is important to remember that, unless the water in a soil is kept in circulation, no air can enter between the particles of it. On damp mountain lands drainage has also another important office. It prevents landslips and washes. The rainfall is usually abundant in such localities and the soil cannot absorb the water as fast as it falls. Hence landslips occur. This never happens in forest land, because the soil is bound together with a network of roots. When however the forest is destroyed, and the land tilled and planted with cacao, the loose soil is then easily swept away by heavy rains. After a shower each stream and watercourse demonstrates most clearly that a large quantity of surface soil has been carried away, until finally, unless care is taken to prevent this by a proper system of drainage, there is nothing left but the bare sub-soil from which cacao trees cease to obtain any nourishment.

Surface drainage is the only method practicable in cacao fields. All such drains should be carefully laid out with a view to prevent washes. No drain should be made straight up and down the face of a hillside. Advantage should be taken of ravines and natural water courses wherever they occur and "contour" drains, 18 inches wide and 2 feet deep, should be regularly led into them at a distance of 40 to 50 feet apart. These drains should be made at an incline of 1 foot in 15, according to to the steepness of the land. By having a system of drains made at any easy gradient, such as that above described, it is possible to recover a large quantity of the soil washed out of the land. It might be found beneficial to have all contour drains cleaned out at regular intervals during the rainy season and the ould spread between the trees.

5. *Manuring* is the next step necessary to restore old cacao trees. Manures supply the soil with the food required by the plants. This food may be either deficient in the land itself or taken out of it by cultivation. To the small grower pen manure would probably prove of the greatest value. Pen or farmyard manure is what is known as a general manure, and can be applied with safety to all soils and to all plants. It is of the greatest value, not only on account of its manurial action, but also on account of the mechanical action, which the burying of large quantities of trash and other refuse exercises on the particles of the soil. Pen manure should always be applied about 4 feet from the stem of the tree, in a shallow trench, and should be lightly covered with soil. In cases where the soil has been long neglected and contains a large amount of sour organic matter, it may be found necessary to apply a top dressing of lime, a few months before using farmyard manure. Lime acts beneficially in many ways. It decomposes all kinds of vegetable matter in the soil and corrects any acidity due to the presence of organic acids. It also has a good effect on the mechanical condition of soils. On stiff and retentive clays it pulverizes and lightens the particles, thereby improving the drainage and reducing any undue excess of organic matter. On soils deficient in available lime a top dressing of about 4 tons per acre would probobly be required. When applying calcareous manures they should be kept near the surface and not deeply buried in, as lime quickly sinks into the soil and has a tendency therefore to run away from the roots of the plants.

Artificial Manures. Professor Harrison after an exhaustive examination of the soils of Grenada recommends generally Basic Slag or Thomas Phosphate powder. This should be applied broad cast in quantities of about 2 lbs. per tree on the forked surface. It should afterwards be lightly worked in and a top dressing of about ½ lb. of nitrate of soda or sulphate of ammonia per tree may subsequently be given.

Governor of Windward Islands—to Commissioner of Agriculture.

Windward Islands.
Miscellaneous.
No. 72. Grenada, 31st May, 1899

Sir,—I beg to acknowledge and thank you for your interesting and useful letter G. 1439 of the 26th instant embodying suggestions for dealing with old and neglected cacao trees.

2. I have directed the publication of your letter in the Official Gazette. It will also be laid before the Grenada Agricultural Society as you desire.

3. Too much importance cannot be attached to the question of the suitability and composition of artificial manures locally imported for use in the island. I had intended to have earlier written to ask you what quantity of each kind you required, and would suffice for purposes of analysis. Would it not help the question to have also specimens of soil from exhausted cacao areas? Kindly let me know.—I have, &c.,
(Sigd,) ALFRED MOLONEY, *Governor*

SOME FUNGI OF THE CACAO TREE.

(With Plate.)

BY J. H. HART F.L.S.,

Superintendent, Royal Botanic Gardens, Trinidad.

One of the earliest records of disease among cacao trees is that given by Long in his history of Jamaica. In 1671 Long states that there were as many as sixty-five "walks" in bearing, while in 1882, only small patches, of no great extent remained. Long also records that the Plantation were destroyed by a "blast."

What this blast was there is little evidence to prove, but taking one interpretation of the word, "to strike with some sudden plague," it may possibly have been occasioned by the rapid spread of some indigenous parasitic fungus. The time of

the occurrence has been fixed by a 19th. century writer as "sometime during the last century."

The late Sir L. A. A. De Verteuil, K.C.M.G., M.D., in his book on Trinidad, page 431, states:—"The prosperity of the Colony had now reached its culminating point, Cacao selling at a high price. But in the year 1727 according to Guimilla, not a disease exactly, but a blight attacking the pods under certain atmospheric influences, destroyed the crop." Later, he records that the *Forastero* variety was introduced and succeeded beyond expectation, and writes. "It is this quality which is cultivated in our days."

In 1898 attention was specially called to a disease which attacked the pods of cacao destroying a large percentage of the crops in many districts in Trinidad.

The matter was taken in hand by the Botanic Department and close investigation showed that the pods were destroyed by a parasitic fungus which could be speedily propagated by inoculation with spores taken from diseased fruit. Several cultures of the fungus were made, and these, with other living materials, were sent to Kew for examination and report.

The results of this examination were published in the "*Kew Bulletin*" for January and February 1899, as follows:—

"Microscopic examination revealed the presence of two distinct fungus parasites; one being the well-known *Phytophthora omnivora*, De Bary, a species closely allied to *Phytophthora infestans*, De Bary, the cause of the potato disease; the other a *Nectria*, which proves to be new to science, and will be known as *Nectria Bainii*. The *Phytophthora* was present on all the pods sent and may be considered as the cause of the present epidemic in Trinidad.

The same, or a closely allied species, appears to be the cause of the cacao-pod disease in Ceylon.

PHYTOPHTHORA OMNIVORA. *De Bary*.

"This fungus, as indicated by its specific name, is not fastidious in its choice of a victim, and has been recorded as attacking various species of plants belonging to the following genera:—

Acer, *Alonsoa*, *Abies*, *Cleome*, *Clarkia*, *Cereus*, *Epilobium*, *Fagus*, *Gilia*, *Larix*, *Lepidium*, *Melocactus*, *Œnothera*, *Picea*, *Pinus*, *Solanum*, *Semvervivum*, *Salpiglossis*.

If the fungus is confined to the fruit of the cacao tree it is obvious that infection each season must necessarily be derived from some outside source, the spores for this purpose being in all probability often produced on diseased fruit or "shells" lying on the ground under the trees; nevertheless, being able to leave on such a variety of host-plants, infection of a plantation for the first time might every possibly be attributed to wind-borne spores produced on some other kind of host-plant. This may appear to be poor consolation. However, it is well to be in possession of all known facts and possibilities in connection with the subject under consideration. The life-history of the fungus is well known, having been carefully studied by De Bary, Hartig, and others.

The conidial form of fruit appears as a very delicate white mould on the surface of the part attacked. The conidia or reproductive bodies are ovate or egg-shaped, being attached at the broad end to a very slender stalk, which shrivels and liberates the conidium when mature. This condition of the fungus flourishes for a few weeks during the period of active growth of the host-plant; and as the conidia are produced in immense numbers and in quick succession, and are dispersed by wind, insects, or rain, being washed from diseased parts of a tree to healthy parts, it can readily be understood why the pest spreads so quickly when once established. Conidia that happen to alight on young pods germinate at once, penetrate the tissues, and quickly produce a new centre of disease which furnishes more conidia in due time.

During the period occupied in the production of the external form of fruit described above, the mycelium of the fungus spreads rapidly in the substance of the pod and gives origin to a second form of fruit imbedded in the tissue of the pod. These reproductive bodies, known as resting-spores, remain for some months in a passive condition, and are eventually liberated by the decay of the pod: when they germinate, the bodies produced on germination being conveyed by wind to the young pods, germination in their turn, enter the tissue, and in a few days' time produce the conidial form of the fungus on the surface of the pod.

Preventive Measures.—If it is ascertained that the fungus is not harboured by the other plants growing in the neighbourhood of the plantation, but is confined to the cacao trees, then prevention becomes an easy matter. It depends on having every diseased fruit collected and burned; for the only possible cause of infection in the first instance must arise from the germination of resting spores developed in diseased pods, and so long as these are allowed to remain on the ground under the trees the disease will continue to spread. But the fungus may also attack other wild plants, and thus become firmly established and defy extermination.

The following measures should be taken to combat the disease:—

(1) Spray with Bordeaux mixture, commencing when the pods are quite young, and continuing at intervals of ten days.

A dilute solution should first be used until its effect on the fruit and foliage is ascertained. A small quantity of dried blood should be dissolved and added to the mixture; its adhesive property is much increased and fewer sprayings are required.

(2) Remove all diseased fruit from the tree, if practicable, otherwise a continuous supply of conidia will be furnished until the fruit decays. Do not allow diseased fruit or "shells" to remain on the ground. All such should be collected and burned.

(3) Endeavour to ascertain, by careful examination, whether the fungus may not be also parasitic on other hosts; it very frequently attacks seedlings, and would be recognised by the wilting of the attacked parts, and by the delicate white mould-like conidial form of reproduction."

The disease had some years previously been observed in Trinidad, but no special study was made of it. It was detected by Professor Harrison in Surinam, and in Grenada by Mr. G. Whitfield Smith, but little notice however was taken of it until the end of the year 1898, when its rapid spread caused some alarm.

The disease was observed to be most prevalent in places where the atmosphere was humid and where the pods had been allowed to rot beneath the trees.

NECTRIA BAINII, *Massee*.

"This parasite causes semi-circular dark blotches to appear on the pods, the diseased portion becoming soft and watery. At a later stage the blotches become covered with a lovely interwoven layer of yellowish-rust coloured or orange mycelium which is studded over with the minute red perithecia or fruiting organs of the fungus.

This parasite may possibly be quite rare, but great care should be taken to arrest any attempt on the part of the fungus to attack the trunk of the cacao tree, for as already stated the destructive canker disease of Ceylon is caused by a *Nectria*."

"*Nectria Bainii*, Massee—*Perithecia* gregaria. mycelio maculiformi flavo—ferrugineo vel aurantiaco insidentia, sphaeroidea. rubra, lanosa, denum supra calvescentia, 300-350 *Microns* diam. *Asci* cylindraceo-clavati, breviter pedicellati, octospori, 80—90×7—9 *Microns Sporæ* distichæ, oblongo-ellipticæ, utrinque subacutæ, 1 septatæ, 10—12 + 5 *Microns* hyalinæ.' —Geo. Massee.

"The *Nectria* appeared on two pods, and this again possesses many points in common with the *Nectria*, which has caused such destruction to cacao trees in Ceylon by attacking the bark of the trunk and branches, as described by Mr. J. B. Carruthers,

At present, no mention is made of other other than the pod disease in Trinidad, but the fact of a parasitic *Nectria* being present, necessitates the prompt execution of measures calculated to prevent the parasite from extending its ravages."

It will be seen therefore that the Kew authorities were of opinion that the *Phytophthora* was the cause of the destruction of the pods, and later evidence appears to confirm this view.

There is however considerable danger to be apprehended from the spread of *Nectria*, or second species discovered.

Subsequently another, and yet un-named, species of *Nectria* has been found destroying the bark of cacao trees in Trinidad. Thus there are three distinct fungi, which are known to attack cacao trees in Trinidad.

It has been found that *Phytophthora* attacks pods at all stages of their development and frequently when partly ripe, and experiment proves that, owing to the attack of the fungus, there is a loss of weight of 25 per cent. in the beans produced, and, at the same time, a very considerable fall in their quality.

In the old authorities quoted, there is some evidence that a disease existed which was very destructive to cacao, but the exact nature of which was undetermined. It is further reported that it was impossible to grow the indigenous varieties and an imported strain was introduced which proved to be more hardy.

From the results of the attacks recently experienced coinciding in some points with the old records it is probably to be inferred that the diseases of the 18th. century were similar visitations to those of recent years.

There is distinct evidence, however, that the older kinds of cacao were not wholly obliterated, and that the introduced variety has since intercrossed with the original. It does not appear, however, so far as present imformation goes, that those strains bearing greater relation to the indigenous types, are more susceptible to disease than *Forastero*, for the latter appears to suffer equally with others from the attack of *Phytophthora*.

The evidence in support of the view that the older "blasts" and "blight," attacking the pods a century ago, are the same as those of to-day, is incomplete and wanting. The probability, however, that they are identical is an impression which is widespread.

It would be no little satisfaction to the planter if they could be proved identical, as it would show the intermittent character of the pest, and relieve growers of the fear of constant attack. A fact, which favours their being identical, is their partial disappearance during the dry season of 1899 and 1900. This may however be due partly to the adoption of the measures of prevention which were recommended. So far as can be gathered from the evidence at present to hand, it would appear that although these fungi have only recently been discovered, and their life history and destructive character made known, it is probable that they have always been present, and, if sufficient care is exercised, may be kept within due bounds, and will not succeed in seriously damaging the crops. The character of the organisms and their mode of reproduction teaches that the careless and untidy planter will be the greatest sufferer, when a succession of seasons are experienced favour able to their growth, while he who keeps his cultivation clean, and in good order may expect to escape with minor injuries.

ANIMAL MANURES.

A MALODOROUS subject is the dung-hill, withal it is one of great and growing importance to the agriculturist and planter, I am afraid the best of us have more or less lamentably failed in grasping its full import in the economy of Agriculture. As usual in matters of agriculture the Americans and Canadians are greatly to the fore in entering deeply into the subject.

I should suppose there is nothing more distressing to read than a lot of laboured satistics yet some statistics are really eloquent and interesting of such a kind I conceive those in connection with manures of animal origin. For example the U. S A. Department of Agriculture calculates there are in the States 16,000,000 horses, 53,000,000 cattle, 45,000,000 hogs and 45,000,000 sheep and if these animals were kept in stalls the year round the fertilising properties of the manure produced would amount to 2,071,400,000 dollars. This enormons total is derived from a consideration of the value of nitrogen, phosphoric acid, and potash as commercial fertilisers.

I suggest very seriously to the Indian Agriculturist that while we keep the mere phrase manure, we at the same time come to a serious consideration of the three great ingredients of soil fertility, namely, nitrogen, phosphoric acid, and potash; and look into the matter in the same emiuently practical business-like way the Americans do. A man sells 2,000 pounds of wheat, in that 2,000 lbs. of wheat, he has also sold approximately R21·8 worth of nitrogen, phosphoric acid, and potash; that much of the fertility of his soil is gone in other words that much of his capital account is for the time being absolutely depreciated. And consequently unless such an one means to deduct so much from cash account clearly he steadily works to nought, in other words he comes to a time when the sum total of the fertility of his soil is gone, save the indestructable residue, which will merely give the amount of crop derived from the fertilising properties of rain: and some consideration from rotation of crops, particularily legumes. This state of things may satisfy the Indian ryot, who apparently labours to merely live or rather exist, and who would not labour at all if by any means he could exist without it: but the European planter, the intelligent zemindar, and the agriculturist who see some thing in life more than mere existence should bestir himself to a much fuller appreciation of the commanding importance of animal manures in agriculture. Elaborate and conclusive investigation into the character of animal manures reveal a whole set of facts of great importance to the agriculturist; and many of which are sadly neglected, resulting in great loss to the soil and considerable revenue to the producer. First, it is important to note that very quickly after being voided animal manures commence to ferment: horse and sheep manure very rapidly, and pig and cow manure more slowly. This ferment is due to minute organisms belonging to two great classes those which demand an abundant supply of air and die without it, and those which grow without oxygen and die when exposed to it: known to science as aerobic and anaerobic ferments. In this matter of fermentation lay a great deal, indeed all the possibilities of a rich fertilising manure, or a blackened mass of comparatively worthless material largely depleted of its nitrogen, and phosphoric acid and potash.

Dr. Voelcker's experiments show that manure preserved in heaps under cover after a year had lost 14 per cent of its nitrogen, the same exposed 30 per cent, and in thin layers exposed 60 per cent at the end of one year. Elaborate experiments by the Canadian Department of Agriculture show that after three months about, no advantage accrues from keeping manure, on the contrary a steady depreciation sets in. It would appear that by this time the micro-organisms of the manure and which, by the way are largely excreted with the manure have done their work of breaking up and simplifying the organic portions of the manure quite sufficiently and that after this period further decomposition out of the soil is more likely to represent a loss than gain of soluble fertilising matter, particularly nitrogen. This apart the case is made out most abundantly for a system of preparing manure, so that it shall retain all or nearly all its fertilising properties, *i.e.* its nitrogen, potash, and phosphoric acid, and this can only be done to the

best advantage under cover where it is not exposed directly to the sun, but most of all to heavy rains. Manures allowed to ferment their own way, and exposed to all weathers are very far from being what they look to be; indeed they may be likened to the glitter without the gold, the form without the substance and since a worthless manure costs just as much to put on the field as a good one, the very serious loss is inexcusable. A simple and effective, and cheap arrangement is that of the French agriculturist who make up two flats with cemented inclined bottoms and between the two is a pit or small well, and into this is inserted a cheap manure pump for the purpose of systematically pumping out the drainings on to the manure heaps; if the draining is insufficient then water is added in droughtly weather. The cardinal principle is to prevent a violent ferment which sufficient moisture does, but the manure should also be compactly and firmly built up, so as to exclude excess of air which would give the aerobic ferment too much scope for action to the detriment of the manure. This is especially applicable to horse manure which ferments rapidly and violently, unless thoroughly wetted and well compacted. All sorts of odd places may do for the purpose of preparing manure where it exists in only reasonable quantities, but it should be under cover of some kind. The manure must be uniformly mixed, and if need be wetted and kept from start to finish thoroughly moist and all drainings regularly returned to the manure: then when the manure is ready it should be promptly put on the field and ploughed in, or if this is not convenient I suggest the covering of it up with a layer of soil until required. Experiments and analyses go to show that manure merely tossed into a pit or heap and exposed to the elements lose half its fertilising matter in six months, while on the contrary carefully preserved and made manure under cover makes a difference of ten bushels of wheat and four tons of potatoes per acre.

People in this country seems to hold a high opinion of cow manure, but the U. S. A. Department of Agriculture gives the relative fertilising value of manures as follows:—Poultry, sheep, pigs, horse, cows thus it will be seen cow manure comes last, but the sum total of manures from a cow is more than double that from a horse in the course of a year and, moreover, the fertilising value of a manure does not exhaust its value by any means least of all in a tropical country like India: a good dressing of cow manure will last much longer and show its effects long after a similiar dressing of horse manure has disappeared.

Numerous analyses show that the value of all animal manures bears a direct relation to the kind of food they receive. For example, linseed and cotton seed meal abstract from the soil per ton 105 and 135 lbs- of nitrogen respectively. Turning to a table showing the amount of nitrogen in manure from many kinds of feeling stuff, linseed meal figures at 16 dollars worth of nitrogen per ton of manure. Cotton seed meal at 20 dollars ditto whereas turnips figure at 0·48 and Indian corn meal at merely 453 per ton and so on.

Analyses show that all manures contain from 50 to 95 per cent of the fertilising matter contained in the food stuffs consumed, so it necesarily follows that the value of manure can be gauged roughly from the nature of the food given.

Animals which have reached maturity and do not grow, more or less, excrete practically all the fertilising matter of the food stuffs consumed. On the other hand milch cows and young growing animals excrete from fifty per cent of the fertilising matter consumed.

The urine of animals varies considerably, but it is highly important to note the urine is even more available than tha manure of some animals, containing as it does a large percentage of perfectly soluble fertilising matter, especially so in the case of horses, and sheep, but analyses show that urine is nearly wholly deficient in phosphoric acid and that by far the best plan to obtain an uniformaly high fertilising manure is to use the urine with the solid manure.

The following table shows the immense importance of securing the urine of all animals, and represents the amount of nitrogen in solid and liquid after complete removal of water from both:—

	Nitrogen, Solid Per cent.	Liquid. Per cent.
Horses ...	2·08 ...	10·9
Cows ...	1·87 ..	10·0
Swine ...	3·00 ...	12·0
Sheep ...	1·78 ..	10·4

Generally one-half and sometimes much more of the nitrogen excreted will be found in the urine and a large portion of the potash, but little or no lime or phosphoric acid. Nearly, all the potash and phosphoric acid in food stuffs is excreted by animals; and the urine is much richer in nitrogen than the solid matter, hence combination of both is the best of all.

But since urines are especially rapid and effective in setting up ferments, care at all times is required never to allow the heaps to over ferment or become dry, otherwise the loss of nitrogen in the shape mainly of ammonia becomes very great.

CONCLUSION.

(1) It is a matter of first class paying importance for the agriculturist to give the strictest attention to his manure heap; (*a*) for the high rate of fertilising matter properly managed it may contain: (*b*) for the additional value in aerating and keeping the soil in good physical condition.

(2) Animal manures should be systematically kept moist and in this country well compacted into firm heaps under cover out of the way of the fierce sun-heat and rains.

(3) No good purpose is served in keeping manure after three months out of the soil, but if unavoidable a good plan would be to cover over the heap with a good layer of soil.

(4) Cow and pig manures being of a slow, steady fermenting character should be mixed with rapid highly fermenting manures such as horse and sheep.

(5) It is highly important to secure all urine and incorporate it with the manure.

(6) The fertilising value of all animal manures bears a direct relation to the quality of the food stuff the animals receive, highly fed animals giving rich manures and poorly fed ones light manure.

(7) The following substances are good for fixing the nitrogen of manures and generally preserving them —superphosphate, gypsum, and kainit (a manufactured form of potash) for cow and horse manure at the rate of about a lb. per 1,000 lbs. of manure and for sheep and pig manure about 4 ounces per 1,000 lbs.

CAMELLIA.

Banana Caltivation in Fiji.—The exportation of fruits, and especially of Bananas, continues to rise, and according to the report of the German Consul, the value of the exports rose from £25,477 in 1898, to £30,606 in 1899. Nevertheless this crop is considerably less than could be obtained. The plants are subject to a disease, the cause of which is not as yet ascertained. During the first year no injurious appearances are remarked, and the plants bear handsome bunches of fruit, but suddenly they become unhealthy and must be grubbed up. With the aim of overcoming the disease, new plantations are laid down, but under the disadvantage of getting always further from the seaports. Some of the planters are importing varieties of Bananas from other countries, in the hope of obtaining one or more which may resist the disease.—*Gardeners' Chronicle.*

COFFEE IN DISTANT LANDS:

GUATEMALA.

In a short notice issued by one of the principal London commission houses, in March of this year (1900), we find the following words :—

"The quality of coffee from Guatemala up to date leaves much to be desired this year, and the great defect is frequently noticed that it has not been sufficiently dried, a fault which causes the fruit to suffer much both in colour and quality. Once more we advise our friends the planters to see that their coffee is perfectly dried, otherwise they expose themselves to inevitable losses."

Such remarks call for no comment, only reasonable carefulness is needed to avoid such criticism as this.

The political disturbances of the autumn of 1897 were the cause of the planters losing a great part of their crops that year, owing to the Indians, who contract to come down for the picking season, remaining away through fear of being forcibly enlisted for the army. The most productive coffee district was also for some time in the hands of the revolutionists. These circumstances combined with the serious fall in prices that took place in the marks of the world had as a result, that the small quantity shipped, which was mostly of an inferior quality hardly paid the shipping expenses, to say nothing of the working expenses of the plantations. As a rule, also, the planters were left without any funds to keep their lands in good order free from weeds, which grows very rapidly here, greatly prejudice the bearing powers of the trees so that the foreign houses very reluctantly had again to provide funds to their customers in order that the following crop should not be lost. That crop (1898) again turned out very small, the planters had been properly cared for, for the owners only being able to do the most necessary work on them, and being deeply in debt they began to get disheartened. The prices of the coffee continued to fall heavily, and coffee-planting seemed, in this country at least, to leave a serious loss on the year's working.

As a consequence very little re-planting was done, and as this was also omitted to a great extent during the preceding two years, and old trees are continually going out of production, the next crop will also be likely to suffer somewhat as regards quantity, and perhaps quality, as the young trees give the best beans.

As regards the crop of 1899, now being shipped, it is again found to be below the average, but all is not yet shipped and statistics are not to hand.

The quality is also said not to be as good as in former years. The weather last year was not favourable to the growing berries, and the product has suffered both in colour and in size.

On the other hand the prices realised in Europe have been so far highly satisfactory, owing to an improvement in the position of the coffee market in general and probably owing also to the falling-off in the shipments from Brazil.

If this rise in prices continues, it is quite possible that many planters who appeared some months ago to be hopelessly involved may, by hard work and devotion to their duties, come well out of their financial difficulties. In order that they may so extricate themselves, however, it will be necessary not only that prices of coffee remain high, but also that internal tranquillity should reign in the country, so that labour can be obtained, and also that the tax on the export of coffee should not be raised again immediately, now that it appears that coffee-planting is once more a profitable form the industry.

The high rate of exchange has of course, immensely benefited planters as the expenses of production, shipping, etc., are paid by them in the depreciated currency of the country.

The cost of production varies considerably in every district, but, putting it roughly, including shipping and forwarding expenses at 20 dol. per quintal, and the net result after sale of the coffee at 40s. per quintal, it will be seen that if the exchange were at 100 per cent. as it was a few years ago, before the commencement of the present economic crisis, there would be no profit at all. Consequently the present momentary prosperity of the coffee-planters depends almost entirely on the high rate of exchange, for it is certain that wages, etc., would not be correspondingly reduced should the natural currency again fall to par or to within 100 per cent.

The planters who owe no money abroad, but who in times of prosperity borrowed money of the banks here and thus only have to pay in the depreciated currency are, of course, very favourably placed. For instance, local buyers of coffee, at one time a month or two ago, paid freely the price of 65 dol. a quintal of parchment coffee, and as it probably did not cost more than 15 dol. a quintal (actual cost of labour, without interest on debts or capital) the planter is in a position to credit his bankers a fair proportion of his debt including over-due interest, and retain a sufficient sum for working expenses during the year. Those (the great majority) who borrowed gold in Europe are unfortunately not in such a happy position, for although they are also slightly better off for the rise in prices their profits when converted into gold do not leave them much with which to pay their debts and carry on the work of their plantations.

The Director-General of Agriculture, a Department of Government only founded in the middle of the year, has issued an interesting report to the Minister of Public Works, in which he explains the efforts the new department are making to encourage and improve agriculture throughout the country. To this effect a circular was addressed to each departmental political chief calling on him to forward a yearly report of the agricultural and other works and statistics of his department. This being quite an innovation, the reports returned at the end of the past year leave something to be desired in the way of detail, especially with regard to agriculture, but, on the whole, a decided impetus seems to have been given to the great national industry, and fuller and more trustworthy statistics are forthcoming than have ever before been obtainable.

The Director-General says :—

"The programme traced out for this department by the laws under which it is established is very wide, and if the circumstances of the Treasury were other than they are something would already have been done to encourage the various branches of industry under its care, by means of spreading widely a knowledge of the modern system of cultivation by the distribution of pamphlets and paper on agriculture, seeds, plants, etc., all of which, however, would have necessitated outlay, which, for the present, Government is unable to make.

"The department has every confidence in the good results which agricultural experiments will yield in countries which, like Guatemala, may be said to be beginning to learn the art of cultivation, because the conviction of the truths spread in print is not grasped by the minds of the majority of agriculturists except when impressed by practical results."

The Director points out that a coffee planter may learn many useful lessons by watching the results of the methods employed by his neighbours, engaged in the same pursuit, and that as he studies the methods of others who grow various different products, his general knowledge of agriculture will be greatly increased. In view of these opinions, the Director proposed to the Minister of Public Works the establishment of a model farm on the National lands as soon as the financial difficulties in the way should have been overcome.

Various examples of the efforts of the department to encourage agriculture and implant confidence as to its impartiality were given, as for example labourers who had been sent by the local authorities in different departments to work on the plantations near the coast at the very moment when they were commencing to sow wheat and maize were upheld in their complaints, while, at other times, labourers ordered to work on the roards at the time of the coffee harvest, thus depriving the planters of labour at the most important period, were sent back to the harvest.

On the future of coffee production, the Director writes :—

"This department under my care considers that the almost prohibitive duties which exist on coffee in foreign countries will always be an obstacle to any scheme having for its aim the generalisation of coffee in the world is enormous, and as this increases, the consumption does not seem to increase at the same rate. The instability of the market for this fruit commenced about two years ago, and we can judge of the results by the compromised condition in which these countries find themselves which have devoted themselves entirely to its cultivation.

"If for reason extraordinary we are still permitted to keep our place in the markets of the world, we must seize the opportunity to think for the future.

"Long is the list of vegetable products which we can export, with greater advantage than coffee perhaps, and certainly without running the risks to which is exposed a fruit produce by all the continents of the world with the exception of Europe. We have a multitude of plants whose utility we scarcely suspect, but which are well-known and valued abroad, plants which grow wild in our fields and which are continually destroyed as their value is unknown.

"Such for example is the plant which the Indians use for thatching their houses, and whose long, flexible and strong roots are used abroad in the manufacture of brushes, brooms, &c.

"This product is well-known in Europe, and Mexico exports this plant alone to the annual value of 3,000,000 dol., the preparation being of the most simple nature and consisting only in pulling out the roots with care not to break it, washing it and drying it in the sun.

"The value of this product in New York varies from 7 to 17c. gold per lb., and the cost of production and transport does not amount to 5c. We must also remember that this plant is obtained in districts so arid as not to permit the cultivation of other planters and that the severity of the climate does not affect it, which has fruites, recommendation."—*Planting Opinion.*

PLANTING NOTES.

"WEST INDIAN BULLETIN."—The fourth number of the first volume of the *West Indian Bulletin* includes paper on: Moth Borer in Sugar Cane, by H. MAXWELL LEFROY; Sugar Cane Experiments at Barbados, by Prof. J. P. D'ALBUQUERQUE, and J. R. BOVELL; Experiences with Seedling Canes in British Guiana, by F. J. SGARD; Sugar Cane Experiments in Louisiana, Fixation of Atmospheric Nitrogen by Leguminous Plants; Tree Planting in Antigua, and Care of Pasture in Antigua, by the Hon. FRANCIS WATTS; Cacao Industry in Grenada Fungi on the Cacao Tree, by J. H. HART; Agricultural Education in English and in French Rural Schools; and Fumigation of Seeds and Plants. The article mentioned above on the Caca disease is accompanied with an illustrative plate.—*Gardeners' Chronicle.*

TIMBER 1,000 YEARS OLD.—Experts seem to be divided as to which of the two hard woods—Jarrah and Karri—of Western Australia is the most durable. Jarrah wood piles 2 feet 2 inches square, driven thirty-three years ago at the Largs Bay pier, were found on examination to be as sound as the day they were put in. Some specimens of Karri wood taken from a fence were examined in London, and though the wood had been underground for twenty-five years it was perfectly sound. A specimen of Jarrah wood under similar circumstances showed serious decay. Timber of the Tamarisk or Shittem wood has been found perfectly sound in the ancient temples of Egypt in connection with the stonework which is known to be at least 4000 years old.—*Journal of Hoticulture.*

LAVENDER FARMING.—Why not earn a living by scent farming? That is the latest hint to the unemployed woman with a certain amount of capital. At Mitcham, Willington, Sutton, Banstead, and through the neighbouring districts vast quantities of scent-producing crops are grown. A contemporary describes a recent visit to one of these scent farms, occupying an area of over 600 acres, covered with broad breadths of Lavender, Peppermint, Rosemary, Camomile, and Pennyroyal. In the centre of one field of Lavender, comprising some 70 acres, the owner has erected a two-storied chalet, from which commanding views are obtained of all the neighbouring fields. It was delightful in such a breezy atmosphere to breathe the delicious odours given off under the influence of a July sun, the power of which puts strength and merit into the oily organs of the purple blue spikes which wave in every direction. As there must always be a world-wide demand for these sweet commodities, it would seem to be an undertaking eminently adapted for ladies. Firstly, the right kind of land must be acquired, a deep sandy loam, preferably overlying chalk. A plantation of Lavender stands four years, and it costs about £40 per acre to prepare and put out the young plants, so that there is but trifling return the first year; after this they commence to be productive, and in favourable times the crop will give from 20 to 30 lbs. weight of oil per acre, which in good quality is worth about 40s. per lb. The fine odour and strength of the British product makes it worth from four to six times that of continental growth. August is the month for cutting and distilling. As the season approaches all is bustle and activity. Lavender is cut with a sickle, laid with regularity in mats, carried to the great vats, and after a boiling process of about two hours' duration the rich oil comes out through its proper channel, and is soon prepared for the wholesale druggist to handle.—*Journal of Horticulture.*

PEARL OYSTERS AND PEARL FISHERIES:

MEETING OF THE CEYLON BRANCH ROYAL ASIATIC SOCIETY ON OCTOBER 27.

The meeting on Oct. 27th at the Colombo Museum, was one of the most successful and interesting to the general public of those which have been held for a long time past by the Royal Asiatic Society. The presidency of His Excellency the Governor added distinction to the occasion and assisted towards attracting a larger audience than even the great interest of the subject might have secured. The number present would doubtless have been increased but for the heavy rain which was falling sometime before the meeting began. His Excellency, in the speech of the evening, was in one of his inimitably happy moods, drawing together the threads of the discussion in dexterous fashion, illuminating all with abundance of humour and adding just so much official encouragement as regards the development of our pearl fisheries as was generally to be desired. The discussion elicited by Mr. Collett's excellent paper and Captain Donnan's practical remarks was valuable as well as full of interest.

H.E. the Governor, Sir West Ridgeway, presided, and was supported by the Bishop of Colombo, Mr Oliver Collett (the reader of the paper), Mr John Harward, Mr R Ponsonby, P.S. to the Governor, and Mr Gerard A Joseph; while among those present were:—The Hon. H H Cameron and Mrs Cameron, Mrs Collett, Mr S M Burrows, Capt. J Donnan, Mrs and the Misses Donnan, Mr and Mrs Ferguson, the Misses Ferguson, Mr R H Ferguson, Mrs Collett, Mr S J C More and Mrs More, Mr A Haly and Miss Haly, Mr F Crosbie Roles, Mr C Harward, the Rev. W R and Mrs Peacock, Mr and Mrs Frederick Lewis, Miss Halliley, Mr H J C Prior, Mr E E Green, Mr C M Fernando, Dr. W G VanDort, Miss VanDort, Mr H VanDort, Mr A F Mahn, Dr. W H de Silva, Mr W E de Silva, Mr P E Morgappah, and a number of others.

After the minutes had been confirmed, the following new members were elected:—Messrs. J W Robertson, W.A.D., J Perera, and A F Mahu.

His Excellency then introduced Mr. Collett, who proceeded to read his paper:—

MR. COLLETT'S PAPER.

The Pearl Oyster Question, which has always had a special interest for the Members of this Society, has of recent years become one of growing general importance; for, in proportion as diamonds are becoming more plentiful, the demand for pearls, as ornaments, is likely to increase.

It might be said that there is little that is new to be discussed before this Society regarding pearl fisheries, seeing that the subject has already found able mention in two valuable contributions to our Journals.* But, hitherto, no attempt has been made to treat the matter from a zoological standpoint, or to go over the field of research systematically, with a view to show in what special particulars the methods employed in conducting the various pearling industries of the world chiefly differ.

I now propose, therefore, to lay these aspects of the matter before you, and at the same time to endeavour to bring to a focus all information that is up to the present on the subject of pearl fisheries.

And first let me remark, in regard to the term "fisheries," that its employment here is, in a strictly scientific sense, incorrect, since the animals by which pearls are produced properly belong to the class *Mollusca*, and not to that of *Pisces*. However, in this connection we chance to have the opinion of an eminent zoological authority.

Lecturing, in 1895, at the Royal Colonial Institute* upon "Whales and Whale Fisheries," the late Sir William Flower, then Director of the British Museum (Natural History), remarked:—

"It happened to me a few years ago to receive a semi-official inquiry from the Colonial Office as to whether a lobster was a fish, because an important point in the dispute between the French and English about the Newfoundland Fisheries depended upon the interpretation of an old treaty in which the word 'fish' occurs. After giving the modern naturalist's definition of a fish, by which a lobster is clearly excluded from the class, of course, I found it necessary to remind my correspondents that in such a case the real answer to the question lay in the sense in which the word was used at the time of the treaty, and by those who were parties in drawing it up, and if that could be ascertained it would be more to the point than the strictest of scientific definitions. Now on turning to what was in the beginning of the present century, our greatest authority on the meaning of words, I find in *Johnson's Dictionary* (I now quote from Todd's edition, 1818) 'fish' defined as 'an animal that inhabits the water.' Without doubt this was the general and popular view, as the universally used expressions *shell-fish* lobster and oyster *fisheries*, *whale fisheries*, and even seal *fisheries* abundantly testify. I therefore cannot say that in a certain vague and antiquated sense of the word, 'fish' may not be applied to the animals of which I propose to speak to you."

The seeker after detailed information concerning pearl oysters does not find an abundance of material at his command. On the contrary, the literature dealing with these animals is extremely poor and deficient. It is a remarkable fact that although countless references to pearls occur throughout history, and although the many published accounts of the pearling trade form quite a literature in themselves, there exists at the present time but one work in the English language devoted to pearls, their history, peculiarities, and various uses,† and no single work (so far as I am aware), in any language, which gives an account of the natural history, habits, and instincts of the animals by which pearls are produced.

At the present time information upon these points is only to be obtained by laboriously searching over the many scattered statistical reports issued from different pearling stations. As a rule, these reports are drawn up for purely commercial purposes, or with the object of laying down rules and regulations for the conduct of the fisheries. Yet, here and there, valuable zoological observations occur, by means of which it is possible to form some idea of

* (1) Vane, "Pearl Fisheries of Ceylon," Journal, R.A.S. (C.B.), 1887, vol. X., No. 34; (2) A. M. Ferguson, C.M.G., Address on the "Jubilee Pearl Fishery" at the Conversazione of the R.A.S. (C.B.), November 26, 1887.

* Proc. Roy. Col. Institute, 1895.

† "Pearls and Pearling Life."—E. W. Streeter, London, 1886.

Note.—"Gold, Gems, and Pearls in Ceylon and Southern India"—published by the *Observer* Press in 1888—contains much valuable information on the Ceylon fisheries.

the biological conditions which exist at different pearling centres. And from such sources as these a great part of the material here dealt with has been derived.*

VARIETIES OF PEARL OYSTERS.

Pearls are produced by quite a number of different molluscs, and some of these are very widely distributed. Among the bivalves, the great *Tridacna*, the common oyster (*Ostra edulis*), and many species of *Pinna* produce pearls.

They are also found in certain species of *Unis* and *Anodonta*—fresh-water shells—which furnish the river pearls of Europe and North America. Certain univalve shells also produce pearls, for example :—*Strombus gigas*, the giant "conch-shell," and several species of *Turbinella*. These produce the pink pearls of the Bahamas and of the West Indies generally.

The ordinary pearls of commerce may be divided, roughly, into two classes, viz., false or "seed" pearls, and true or "Oriental" pearls. The two kinds differ greatly both in beauty and value, and are produced by two very distinct genera of shells. These are (1) *Placuna*, with a single pearl-bearing species, which belongs to the family of *Anomiidæ*; and (2) *Meleagrina*, which includes several pearl-bearing species, and which belongs to the family of *Aviculidæ*.

Placuna placenta, commonly known as the "window-shell" of the Chinese (because its semi-transparent valves are frequently used in China for illuminating dwelling-houses), is the "pearl oyster" of the Red Sea, the Persian Gulf, Karachi, the Bay of Tamblegam near Trincomalee, and the Eastern Archipelago generally as far as Hongkong. Although it produces only "seed" pearls, an immense number of people are annually employed in its collection. The pearls themselves are seldom of much value, though there is generally a demand for them in the markets of the East. They are, however, of little importance in the present inquiry; and so we need not further consider them here.

TRUE PEARL OYSTERS.

All of the species of true pearl oysters belong, as I have just said, to the family of *Aviculidæ*—or "wing-shells—and with this family it will now be necessary for us to form some acquaintance. In the first place, it is one of most respectable antiquity. No less than three hundred species have been recorded in the fossil state, some even from the lower Silurian strata. As a large number of these fossil forms have been discovered in northern latitudes, it is probable that at one time in the earth's history the family was very widely distributed, though it is now almost entirely restricted to tropical and temperate seas. At present only twenty-five recent species are known. Of this number, five, which belongs to the genus *Meleagrina*, are now fished for pearls. These constitute the pearl oysters of Madagascar, Ceylon, Japan, the South Sea Islands, Panama, California, and the northern and western Coasts of Australia. Zoologically speaking, they do not belong to the true oysters (*Ostreidæ*), but are much more nearly allied to the mussels, being furnished with a *byssus*, or "cable," by which they are in the habit of mooring themselves to rocks and other substances at the bottom of the sea.

The classification of the different species (and varieties) of *Meleagrina* has not yet been systematically worked out; consequently, their correct identification is a matter of considerable difficulty. We find, for instance, quite a number of shells—bearing both pearls and mother-of-pearl—designated by the common name of *M. margaritifera*; whereas, in all probability, they belong to very distinct species. True, *M. margaritifera* (the mother-of-pearl oyster) does frequently produce pearls, but it differs in many important particulars from the other pearl-bearing species of *Meleagrina*—the shells of which are not, as a rule, of any value as mother-of-pearl.

The geographical distribution of the pearl-bearing species of *Aviculidæ* appears to be as follows :—

1. *Avicula (Meleagrina) margaritifera*, Lin.—The large tropical pearl oyster of Northern Australia, the Pacific, and the South Seas generally. It is the mother-of-pearl shell of commerce, and although it often contains pearls it is chiefly fished for the sake of its shell alone.

2. *A. (M.) imbricata*, Rve.—The pearl shell of the northern coast of Western Australia. It is said to be closely allied to the Panama species. It produces pearls, but its shell is of little value.

3. *A. (M.) fimbriata*, Dkr.—The pearl oyster of the Gulf of California and the Bay of Panama.

4. *A. (M.) Martensii*. Dkr.—The pearl oyster of the Japanese Seas.

5. *A. (M.) fucata*, Gould.—The pearl oyster of the Gulf of Mannar. It also occurs in the Torres Straits and (probably) in the Arabian Seas.*

The pearls produced by the above five species are of every shade of colour, from the pale golden pearl of Northern Australia to the lustrous black gem of the Bay of Panama. Those most generally admired however, and which command the highest prices, are of almost transparent whiteness, with a slightly azure reflection. They are known as the "pearls of the Orient," and are produced by the pearl oyster (*M. fucata*) of the Gulf of Mannar.

NATURE AND FORMATION OF PEARLS.

It will be necessary for us to pause here for a moment to consider what is up to the present time known of the nature and formation of pearls, in order that this discussion may have a sound basis.

* I take this opportunity of expressing my thanks to Mr. R Etheridge, the Director of the Australian Museum, Sydney, N.S.W., and to Mr. Charles Hedley, the Conchologist of that Institution, for valuable reports and statistics. Also to Professor H A Pillsbury, of the Academy of Sciences, Philadelphia, U.S.A., and Mr. T Nishigawa, of the Imperial Fisheries Bureau, Tokyo, Japan, for information kindly supplied. Further, I am under a special obligation to Mr. John Ferguson, of Colombo, who has most kindly placed at my disposal a valuable collection of Papers relating to various pearl fisheries.

* Mr. Holdsworth, the Naturalist engaged by the Ceylon Government in 1867 to investigate the pearl oyster question (but who unfortunately never had an opportunity of seeing a fishery, and, according to Sir William Twynam, never saw a pearl bank with oysters on it), was the first to point out the distinction between the Gulf of Mannar oyster and that of the Persian and Arabian Seas (*Placuna placenta*). Some shells from the Persian Gulf shown to Captain Donnan appeared to him to exhibit no differences from the Mannar species ["Gold, Gems, and Pearls," p. 374]—from which I conclude, having regard to his (Captain Donnan's) great experience, that the Mannar oyster also occurs, though perhaps sparingly, in the Arabian Seas; and this may account for the occasional discovery of fine "Oriental" pearls in that region.

Pearls are an excretion of super-imposed concentric *laminæ* of a peculiarly fine and dense nacreous substance consisting of membrane and carbonate of lime. The question of their origin has a special attraction for the zoologist, since it still forms one of the unsolved problems of science. Pliny held the belief that they were drops of dew or rain which fell into the shells when opened by the animals and were then altered by some power of the mollusc into pearls. This view obtained all over the East, and—strange to say—Columbus found the same belief popular among the natives of Mexico. Moore thus alludes to it in his poem "Peri and the Pearl":—

"And precious the tear as that rain from the sky
Which turns into pearls as it falls in the sea."

At the present day it is popularly supposed that all pearls have for a nucleus a grain of sand which has become coated with nacre by the animal; but this is simply a conjecture which has gradually become regarded as a fact. As a general rule, it is some organic substance, which behaves in the same way as epidermis when treated with certain chemical re agents. In some districts one kind of nucleus seems to be more common than another, and this is how the different results obtained by observers in different localities may be explained The most generally prevalent nuclei appear to be the bodies or eggs of minute internal parasites—such as *Filaria Distoma, Bucephalus*, &c. This was pointed out by the late Dr. Kelaart, in his Report to the Ceylon Government on the Pearl Oyster of Aripo;* and his observations were supported by Humbert, the Swiss Naturalist, who accompanied him to the pearl banks in 1895. More recently, similar observations have been made by Mr. Edgar Thurston, of the Madras Museum;† and the latest conclusions of Science appear to be entirely favourable to the "parasite" theory.

The fact that pearls may be artificially produced by inserting small shot or grains of sand between the mantle and the shell of the animal has long been known. The Chinese have been specially successful in producing pearls in this way; but the best of them are of inferior colour and brightness, and their value is comparatively insignificant. Linnæus, who was aware of the possibility of producing pearls artificially, suggested the collection of a number of mussels, piercing holes in their shells with a fine auger to produce a wound, and afterwards "parking" them for five or six years to give the pearls time to grow. The Swedish Government consented to try the experiment, and long did so. Pearls were produced, but were of little value, and the enterprise was finally abandoned as unsuccessful.

The distinction between fine pearls and these intrusive bodies coated with nacre was recently demonstrated in an important Paper read before the Académie des Sçiences, Paris, by M Léon Diguet. He alleges that the latter have only the iridescence of mother-of-pearl, and are in origin analogous to the deposits which increase the shell. The true pearl, he contends, has no connection with the shell itself, but is a pathological calcification or "stone," and seems to arise from parasites. It begins with a small sac of humour, which becomes gelatinous and calcifies in a series of concentric layers, while at its centre may be found a cavity holding organic matter, the remains of the parasites which gave it birth.*

* "Report on the Natural History of the Pearl Oyster, Trincomalee," 1859.

† "Pearl and Chank Fisheries of the Gulf of Mannar." 1894 p, 18,

"Pearl," says Saville-Kent, "is, unfortunately, one of the substances impermeable to the recently discovered Röntgen rays; otherwise the solution of this mystery . . . might be easily achieved. May be, however, in the near future a new xx., xxx., or other occult luminant will be evolved which shall possess the property of laying bare and naked the nuclei of pearls.†

THE PEARL FISHERIES OF AUSTRALIA.

The pearl fisheries of Australia have of late years developed considerable proportions; they are conducted in the Torres Straits, on the coast of Queensland, and on the northern coast of Western Australia. Here the large pearl oyster *M. margaritifera* is fished, primarily for the sake of its shell, which furnishes the mother-of-pearl of commerce. Pearl themselves, when discovered, are regarded as more or less of a chance product, and are frequently appropriated by the hired diver and boats' crew—and this may be said to be commonly the custom in all the pearl fisheries of the South Seas. The total value of the pearl-shell fishery of Queensland alone amounted in 1898 to £109,401 sterling

On the northern shores of Australia, in addition to the mother-of-pearl shell (from which almost all Southern pearls are derived), there occur two other species, viz., *M. imbricata*, Rve., and *M. fucata*, Gould, which produce pearls. The latter is identical with the pearl oyster of the Gulf of Mannar; but is, curiously enough, regarded with disfavour in the Australian region, where it is known as the "bastard" shell,—probably because its shell is of little value as mother-of pearl, and also, perhaps, because it does not produce fine "Oriental" pearls in the Southern Seas.

The pearling grounds of Australia are leased out to various companies and individuals by the Government. These leases are granted only to approved persons. and are subject to certain important conditions and stipulations. No shell below a certain standard of growth is allowed to be removed from the banks; and all shell shipped for exportation must be submitted to the inspection of a Government official specially appointed to guard the industry. Pearls may only be purchased by licensed dealers, and the Government reserves to themselves the right to prohibit at any time the collecting of pearls and pearl-shell on any particular part of the coast. A constant guard is maintained over the banks, and certain areas are prescribed by the Inspectors when they have reason to apprehend any danger to the oysters from the results of over-fishing.

In the Australian fisheries modern diving apparatus is largely employed, the same being periodically inspected by Government in order to prevent the use of defective gear. Diving for pearls by native divers without diving dress seems likely to be discontinued in this region—especially as it is now found that, as a rule, the best pearl oysters flourish at depths beyond the reach of unprotected divers.

On the whole, these fisheries appear to be conducted upon a more up-to-date and advanced method than elsewhere. Some interesting experiments in

* "Comptes Rendus," cxxviii., 1899, p. 1589-91.

† "The Naturalist in Australia," p. 201.

cultivating pearl oysters were made by Mr. W Saville Kent, F.L.S., late Commissioner of Fisheries to the Government of Queensland and Western Australia; but the very short period over which his investigations extended, and the limited facilities which he enjoyed for the conduct of his research, rendered it impossible for him to achieve results of any value. He however showed that artificial fertilisation and incubation are quite possible, though the questions of conservation and protection from enemies still remain to be dealt with.*

THE PEARL FISHERY OF JAPAN.

In the Bay of Agu, in the Province of Shima, Japan, an extensive pearl fishery exists. The pearl oyster of this region (*M. Martensii*) appears to be the most northerly situated of the pearl-bearing species of *Meleagrina*, and it lives under conditions which more nearly resemble those which obtain on the oyster banks of Europe—where the true oyster (*Ostrea edulis*) is cultivated—than those which surround its own congeners in tropical seas. The Japanese pearl oyster lives in quite shallow water, and is left exposed upon the banks at low tide. This condition of things would seem to present special facilities for artificial cultivation; but unfortunately, on this very account large numbers of the shells perish of the cold in winter. Professor Mitsukuri, of the Imperial University, Tokyo, has inaugurated an elaborate system of cultivation, which gives promise of good results. One of the principal features of the scheme is the collection of the "spat" in shallow water, and its transference to comparatively deep water—6 to 7 fathoms—where the temperature is more equable. Here the young oysters are constantly watched and protected against the attacks of predacious foes. I hope to be able to obtain further particulars of this interesting experiment as the work proceeds. At present fuller information is not available.

Artificial cultivation after the Chinese method has also been attempted in Japan; but, so far, only hemispherical pearls, whose bulbs are attached to the shell, have been produced. Japanese pearls are not commonly seen in the markets of London and Paris, probably because there is always a demand for these at home.

THE PEARL FISHERIES OF CALIFORNIA AND PANAMA.

In the time of the Jesuit Missionaries the Central American pearl fisheries were actively carried on, and produced great wealth to those engaged in the industry. But they afterwards fell into decay, and for many years the banks were thought to have been exhausted. More recently, however, the industry has been revived—chiefly owing to the introduction of modern diving apparatus, which has proved of great utility.

Mr. Townsend, of the U.S.A. Fish Commission, says: "It is not unlikely that the adoption of the submarine engineer's suit by the pearl fishers of La Paz must have been the step which led to the continuance of the pearl fishing industry, for the search for shells can now be pursued into deeper waters than in the days of the naked divers, the best of whom could not descend a dozen fathoms. Half that is rather more than a practical working depth." And again in the same report, Mr. Townsend says "Whatever of romance has hitherto enshrouded the naked diver for pearls in the sea, he is now practically a submarine labourer who uses all the modern diving paraphernalia available. No longer plunging for sixty seconds into the sunlit green water that covers a coral bank, he puts on a rubber suit with glass-fronted helmet, and, suitably weighted with lead, descends for hours to gather pearl oysters, which are hoisted in a wire basket by his companions in the boat above, who also supply him through a rubber tube with the air he breathes." *

M fimbriata is the pearl oyster of this region, but *M margaritifera* is also fished here as elsewhere in the Pacific. Here again, mother-of-pearl shell is the principal object of the search, its value being sufficient to pay the expense of the fishing, leaving any pearls which may be obtained a clear gain. In America also, as in Australia, the banks are rented out for fixed periods to different pearling traders.

In the Pacific the oysters are usually opened with a knife. This, if properly performed, is said to be the best plan, for pearls are considered liable to become discoloured if the animal is allowed to decompose before the shell is opened.

THE PEARL FISHERIES OF THE GULF OF MANNAR.

The principal fishery in this region is that conducted on the eastern side of the Gulf, in the neighbourhood of Aripo, Ceylon—the pearl banks on the Indian coast having now almost ceased to be remunerative.

At the Conference Meeting of the Colonial and Indian Exhibition in 1886, Sir James Longden (formerly Governor of the Island) remarked that the pearl fishery of Ceylon was "one of the most ancient—perhaps the most ancient industry of the world; that it was carried on today as it had been for two thousand to three thousand years; and that it owed little or nothing to modern civilization in the manner of getting from the depths of the sea that wonderful beautiful product of Nature,—the pearl. †

The Ceylon fishery, besides being entirely carried on by unprotected native divers, is further distinguished from those which we have just been considering in being the only fishery in the Tropics where pearls alone are sought for, irrespective of the shells, the nacreous lining of the valves of the Gulf of Mannar oyster (*M fucata*) being of little or no commercial value.‡

It will not be necessary for me to enter into details here regarding the methods employed in the conduct of the Ceylon fishery. They have already been fully described by Capt. Steuart, Sir Emerson Tennent, Mr. Vane, Mr. Edgar Thurston, and, quite recently, by Sir William Twynam in his very complete and elaborate report just published. § Let it suffice to say that the industry is now a Government monopoly, carried on

* See Appendix to the Report of the Government Resident of Thursday Island for 1898, by S. Pace, F.Z.S.

* Bulletin, U S Fish Commission, vol. IX, 1889, pp. 91-94.

† Proc. Roy. Col., Institute, 1886.

‡ The mother-of-pearl oyster (*M margaritifera*) also occurs, though very rarely, in the Gulf of Mannar. See Thurston, "Pearl and Chank Fisheries of the Gulf of Mannar," 1894.

§ (1) Tennent, "Nat. Hist. of Ceylon," p. 373; (2) Capt. Steuart, "Account of the Pearl Fisheries," 1843; (3) Vane, "Pearl Fisheries of Ceylon," R A S Journal, vol. X., 1887; (4) Thurston, "Pearl and Chank Fisheries of the Gulf of Mannar" 1894; (5) Twynam, "Report on Ceylon Pearl Fisheries," 1900. See also the many valuable "Inspection Reports" by Capt. Donnan, Inspector of the Pearl Banks, for the last thirty-seven years.

under the inspection and control of specially appointed officers, the system which was formerly in vogue of renting the pearl banks having been entirely discontinued since the year 1837.

There appears to have always been a considerable amount of uncertainty in respect of the amount of revenue derivable from this industry. Writing in 1697 for the instruction of the Political Council of Jaffnapatam, the then Commandant of that town justly remarked that "the pearl fishery is an extraordinary source of revenue on which no reliance can be placed as it depends on various contingencies which may ruin the banks or spoil the oysters." This statement holds good after a lapse of more than two centuries—indeed, the periodical disappearance of oysters from certain of the banks sometimes for many years at a time, may be said to form one ot the peculiar characteristics of the Ceylon fishery.

Nevertheless, since the British occupation of the Island a sum equal to more than one million sterling has been derived from the fishery ; and the matter is therefore one of immense importance to to the Government of the Colony.

CONSERVATION OF PEARL OYSTERS.

The question as to whether any means can be adopted to conserve the oysters upon the beds and thus to place the industry upon a more stable and permanent footing, must in the first instance depend upon a knowledge of the physical and biological conditions ruling upon the different banks. There are reasons for supposing that these conditions undergo frequent change ; but the cause, or causes, thereof have yet to be definitely ascertained. It is well-known that the northern and western coasts of Ceylon are being gradually uplifted from the sea. On this account* it is possible that an increasing amount of sand—which is very injurious to all bivalve molluscs—is finding its way from the northern rivers into the waters of the gulf.† It may also be that changes in the temperature, and in the degree of salinity of the water, have the effect of rendering certain of the banks untenable to the oysters for more or less prolonged periods. Further, it is stated upon good authority that the strong ocean currents from the Bay of Bengal, which sweep round the coasts of Ceylon and Southern India, contribute largely to the causes which denude the oyster banks. Altogether, it will be seen that this question is one of some difficulty, and that it must involve the solution of quite a number of local marine problems.

On the western coast of South America, which is likewise at present being upraised from the sea, ‡ pearl fisheries formerly existed which gave rise to wealthy and populous cities—"whose very ruins have now perished." Yet, doubtless some day Science will provide means for the revival of these industries possibly—as in the case of the fisheries of California—by the introduction of special diving apparatus ; for after all it may be found that the oysters have merely migrated seawards into deeper and more sheltered waters.

* Mr. Boake, in his *Monograph of Mannar* (1888), tells us that a pearl bank at one time existed on the north of that island ; and according to ancient Sinhalese records, there were formerly pearl banks in the vicinity of Mount Lavinia. It is significant that of the 85 pearl banks in the Gulf of Mannar, viz., 19 on the Ceylon coast and 66 on the Indian, only two the Cheval and Modragam banks, are now profitable.

† "Man-ar" is Tamil for "sandy river."

‡ Darwin, "Naturalist's Voyage in the 'Beagle.'"

In regard to the question of artificial cultivation and conservation it is important to observe that the pearl oyster—like the Strassburg goose—only becomes of special commercial value when it has developed certain conditions of organic disease. We have already seen that pearls must be regarded as a pathological product, and we find this conclusion well supported in the records of the fisheries. These contain frequent references to the number of pearls found in diseased and dying Oysters ; and experienced divers are apparently agreed that the probability of finding pearls is always greater when the oysters are crowded together, and become humped and distorted in shape ;* and at the same time afford cover for all kinds of marine worms and parasitic creatures. Thus unhealthy conditions of living must presumably be encouraged in order to promote the diseases which lead to the formation of pearls. In the course of an address to the Malacological Society of London, in 1896, Professor Howes, referring to the peculiar characteristics of certain marine mollusca (chitons) remarked : "In its bearings on the conditions of local distribution in shallow water, on bathymetric extension, and specific variation as related to these influences, the experimental method appears to me to give promise of most important results in Malacology. Just as the physiological graduates off into the pathological, the full significance of many a healthy or a diseased state becoming intelligible only on a knowledge of its opposite, so, in the hands of the experimentalist, the normal phenomena of animal life will most assuredly in course of time become illumined by prolonged and careful study of the organism under changed conditions. And from all that is now going forward it is plain that the pathologist holds the key to many a life problem."

THE CHAIRMAN then called upon Capt. Donnan to offer remarks on the subject. Capt. Donnan spoke as follows:—

CAPT. DONNAN'S REMARKS.

In regard to the remarks upon the similarity of the Gulf of Manaar Pearl Oysters to those of the Persian Gulf, and the suggestion that the former is comparatively rare in the Arabian Seas, I will relate how I came to ascertain that the Gulf of Mannar oyster is found in great abundance in the Persian Gulf. When I went to England in 1875 I took with me a small sample of Ceylon Pearl Oyster shells to ascertain if they were of any commercial value, and during my visit to London, I went into the office in Mincing Lane of Messrs. Brooks & Faith, Produce Brokers, saw the head of the firm, and asked him if my sample of oyster shells was of any commercial value. He looked at them and said "these are what we call Lingas from the Persian Gulf." I replied, "that they came from Ceylon." He said, "don't tell me that, I know better," and pointing to a shelf on which there were a large number of oyster shells, said, "there are your shells, they have come from the Persian Gulf, and large quantities of them are sent to us regularly from Bombay." He then examined my sample and said, "You have been polishing them up, and if you had not done so, they would have been worth thirty shillings per cwt." I replied that the only polishing they had was that of being exposed to the sun and rain on the beach at Sillavaturai for twelve months.

* These small thick oysters are called by the people "Koddai-pakku," viz. "arecanut oysters" (Twynam's Report, p. 59).

The Lingas on the shelf were similar in every respect to the Gulf of Mannar oysters.

I have recently seen in print that the annual value of the Persian Gulf Pearl Fishery is £300,000.

On my return to Ceylon I obtained the sanction of Government to send home a trial shipment of pearl oyster shells, and in December, 1876, the shells of 12,000 oysters that had been lifted for a sample of pearls for the fishery of the following years were sent to the Crown Agents to dispose of, in communication with Messrs. Brooks & Faith, but subsequently they reported that the shells were of no value.

However, the Gulf of Mannar Pearl Oyster shell must now be of some value, as during the recent fisheries men were sent by mercantile firms in Colombo to collect shells for shipment to Europ

MIGRATION OF OYSTERS AND EMPLOYMENT OF DIVERS WITH DIVING DRESS.

It has frequently been surmised when oysters were reported to have disappeared from a bed and no traces left of them, that they had probably migrated to some other more suitable locality, into depths beyond the capacity of native divers to reach ; and that the employment of European divers with diving dress might be the means of tracing them, or of finding new beds of oysters.

My experience of pearl oysters is that they only move about in their young stage, say up to one year old, and after that age they remain on the bed they settle down upon, if a rocky bed, until they come to ripe old age, unless they are forcibly removed ; but if they happen to come on a sandy bed, they would have no means of holding on, and would most probably be drifted away and destroyed.

I am led to this conclusion, by observing that it is only during their young stage that I find, when at anchor on a bed of oysters, that they attach themselves to the vessel's cable. The fact of the oysters mooring themselves by such a strong cable as they do, would also bear out this conclusion, for if they were in the habit of moving about always, it would be unnatural for them to moor with many threads of their byssus, when one or two threads would be sufficient for a temporary resting-place. But supposing they were in the habit of migrating and got into depths beyond the capacity of the native diver, say 10 fathoms as his greatest working depth, the configuration of the bed of the ocean, in the neighbourhood of the Pearl Banks is such, that a short distance would take them into depths beyond the capacity of even the diver with diving dress, as the edge of the bank of soundings is very precipitous.

It has often been suggested also, that better results would be obtained on the pearl banks by the employment of divers with diving dress, both at inspections of banks, and at fisheries ; but as a matter of fact, I have had experience of the diver with diving dress in both these cases.

Some years ago a European diver was employed regularly at inspections of the banks, and in April, 1884, I had four European divers along with native divers, employed in the fishing of a bank of oysters off Chilaw ; when I found the native divers brought up in a day's work as many oysters per diver as the European divers.

At inspections of the banks, it is necessary to get over the ground quickly, as there are very large areas to be examined, and the native diver, who can be taken about in a handy rowing boat, making a dive when wanted, during which he goes over a space of about 20 square yards, and brings up a sample of what is on the bottom, over that area, all in about one minute, is just the man required. I have never known any of the native divers employed at inspections to give a false report of the state of the bottom, and I have found that I could form a far better idea of the state of a bank from their reports, than I could from that of the European diver, who could not move about as quickly as the native.

In this connection I will relate an amusing incident that occurred during the fishery off Chilaw in April, 1884. One morning the European divers reported to me that there were no oysters where the vessel was anchored, and ked for it to be moved to another part of the bank. I knew from the native diver's report that the vessel was anchored on the best part of the bank, so I called up four native boats, and told the tindals to work close round the ships, which they did, and their native divers sent up oysters, 50 to a dive. On seeing this the European divers began work again, and found oysters. Some time after they had been working, I was looking over the vessel's side, and observing the life line of one of the European divers being violently jerked, I called out to his attendants to haul him up quickly, believing that some accident had happened, and that the poor man might be hauled in unconscious or even dead, but when landed on the stage, he was very much alive, for when the front piece of his helmet was removed, he bawled out in a stentorian voice "Where's the man who stole my oysters." He then explained that he had kept a basket at the foot of his ladder to hold the oysters as he gathered them up, and that when he returned to the basket with the last handful of oysters required to fill it, he found the basket empty and oysters gone, and that his rage at this mishap caused him to tug so violently at the life line. The oysters had been commandeered by one of the native divers (belonging to one of the boats working close by), while the European diver was away from his basket.

This I found out some time afterwards, but as there was no evidence available at the time, the thief escaped punishment, much to the annoyance of the European diver.

PHYSICAL CHANGES IN THE BED OF THE SEA ON THE PEARL BANKS.

As far back as my experience goes, there have been no material changes of this nature. It is true the divers have at times reported small portions of the rocky part of a pearl oyster bed to be covered with a layer of sand a few inches deep, and on one occasion during a small fishery off Chilaw, the divers reported, the oysters were being covered up with sand ; and that they had a difficulty in getting at the oysters as they were swayed to and fro by the sea, although they were at a depth of 9 fathoms. This was evidently caused by a heavy ground swell rolling in at the time, and if it swayed the divers about, was also probably causing the silting up of sand on the oysters. These occurrences are, however, rare, or have been rarely noticed. The bed of the Cheval and Modrigam Paars seem to remain undisturbed by physical changes, as the area and configuration of their rocky portions have been fairly maintained during my time. No silting up or upheaval in their neighbourhood can be detected by the soundings, which have not decreased during the last seventy years. Changes, however, are taking place on the shore in that

neighbourhood. The cliff opposite the "Doric" is gradually washing away, and much of the island of Karraittivu has disappeared since I first knew it. On the other hand the spit forming the western side of Dutch Bay has been extended into the sea in a N.E. direction about one mile during the last 40 years.

ENEMIES OF THE PEARL OYSTER AND CURRENTS.

The enemies of the Pearl Oyster are no doubt many, as it seems to be the nature of all animal life in the sea, to prey upon each other; but the chief ones to be feared and destroyed, if possible, are the various species of fish that feed on the bottom, and for that reason are commonly called rock fish. These, with the exception of skate are, however, only destructive to the pearl oysters when they are young and their shells tender ;say up to the age of 18 months or 2 years, after which age the smaller kinds of rock fish, which appear to be most numerous do not do much harm.

Generally speaking, when I have been at anchor on a bed of young oysters, the crew of the vessel have caught many rock fish, the stomachs of which were found to contain many fragments of the young oyster shells, thus proving the source of their food.

A bed of young oysters no doubt attracts these rock fish, which appear to come on it in great swarms, and although the young oysters are very numerous, and are generally very thickly spread over large areas, I have counted as many as 40 attached to the fragment of an old oyster shell, yet their enemies are numerous also, and are capable of causing much destruction, often completely annihilating the whole bed, leaving not a vestige behind when I visit the bank a year later; so that if some means could be devised of destroying or keeping these rock fish away from a bank of young oysters for a couple of years, there would undoubtedly be more Pearl Fisheries. If, for instance, fishermen could be induced to take say 200 canoes to one of these beds of young oysters, and fish on it daily for 2 or 3 months, it would have a very good effect, and might possibly cause the dispersion of the fish which readily take bait, and the numbers likely to be caught would well reward the fishermen.

Currents must also be classified amongst the enemies of the pearl oyster, for although they bring the spat on to the oyster beds, they also occasionally sweep mature oysters away from the beds.

The most noteworthy current on record is that which in December, 1887 swept away a very valuable bed of oysters, estimated at 155 millions, from the Cheval Paar. Ten millions of them were found during the fishery in the following March, from two to three miles in a S.-easterly direction from their original position. Attributing this to a current I enquired of the man in charge of the steam tug "Active" doing guard duty on the Cheval Paar at the time, and he reported that in the middle of December there was a strong current lasting a week, running in a southerly direction, and was so strong, about 4 knots, that he had to drop a second anchor to prevent the vessel being dragged away by it. The fishermen on Karraittivu island subsequently confirmed the existence of a strong southerly current running in December.

The loss of that bed of oysters was a loss to Government of at least 20 lakhs of rupees.

On this occasion I was able to make an interesting experiment as to the ability of pearl oysters to resist a current. The divers had brought up a large Pinna shell with several oysters attached to it by their byssus. The "Active" was got underway and the Pinna shell towed in the sea alongside. The oysters held on for an hour, while the "Active" was going at a speed of 4 knots, but when the speed was increased to 5 knots they shortly began to drop off one by one. Although the oysters resisted a 4-knot current for one hour, they evidently had to give way when the strain of a current of that velocity was prolonged for a week. I doubt very much their ability to resist even a 3-knot current for that length of time.

Young oysters have a much stronger hold than oysters advancing to maturity. The divers often remark when on young oysters, that they could not bring up many, as they were holding on fast; but when they come away easily the divers say they are fit for fishing.

There is no record of a current similar to that of December, 1887, having occurred previously and I look upon that one as very exceptional, particularly as to its course which was in a S.-easterly direction.

I am of opinion that it was caused by an unusually large volume of the N.E. Monsoon ocean current flowing into the Gulf of Mannar, and seeking an outlet by sweeping round the head of the Gulf, and down its eastern shore, until it joined the main stream, on its course from the coast of Ceylon towards Cape Comorin. It is well-known that the current from the Bay of Bengal in November and December, runs south along the east coast of Ceylon at the rate of 2 to 3 knots an hour. It curves round the south coast, and after rounding Galle, takes a N.-westerly course past Cape Comorin. Some times it follows the west coast of Ceylon to the north of Negombo, and then branches off towards Cape Comorin. A larger volume than usual coming this way would probably advance further up the coast than Negombo, say to Chilaw and then branch off towards Cape Comorin, and in that case some portion of the stream might before reaching Cape Comorin be deflected along the Tuticorin shore and then follow the course I have described. I cannot account for a S.E. current on the Cheval Paar in December in any other way.

There are also unknown enemies of the pearl oyster. For instance when oysters too young for fishing are found dying off in large numbers, it has not yet been discovered what causes them occasionally to be in that condition.

The question of discovering means of successfully securing pearl oysters against their enemies is a most difficult one to solve. Currents are uncontrollable, and as regards living and unknown enemies, success against their predations appears to me to be very doubtful. Yet in these wonderful progressive times there is no knowing what the employment of scientific skill to deal with these questions might be able to accomplish.

ARTIFICAL CULTIVATION OF PEARL OYSTERS.

I have tried a small experiment in cultivating Pearl Oysters, by depositing a quantity of young oysters in an excavation which I had made for them in the Sillavaturai coral reef, three miles from the shore; but it was not successful.

In March, 1885, I had 12,000 oysters 18 months old lifted from the Cheval Paar, and placed in the tank on the reef, three hours after they were lifted; having been kept in the meantime in a boat half filled with seawater. But, when I returned to Sillavaturai the following year they had disappeared. I then constructed a new tank on a more sheltered part of the reef, 12 feet square and 4 feet deep at low water, much mud was found between the branches of the coral, but it was all well cleared out, and a quantity of coral stone was placed in the bottom of the tank and around the side on top of reef to protect the tank from wash of sea at high water.

When this new tank was completed it seemed an ideal place for such an experiment, beautiful clear water in it, and not a sign of mud. 5,000 oysters 2½ years old taken from the Cheval Paar were placed in it; and 1,000 in a large wooden cage, made for the purpose, which was weighted with stone and sunk in 9 feet of water half a mile rom the beach.

I left Sillavaturai on that occasion in hope of my experiment being successful; but alas! on my return a year afterwards I found the oysters in the beautiful tank on the reef—all dead—having been smothered in 18 inches of mud, at the bottom of it, which had been washed into it from adjoining parts of the reef by the S.W. Monsoon sea, and the cage was found broken up, and the few oysters left in it were dead: and thus ended my experiments in artificial cultivation. I subsequently thought of making a preserve on some part of the eastern shore of the island of Karraittivu, but had to give up that idea, as I found on searching for a suitable spot, that it was all muddy bottom, which would have been fatal to young oysters. There appears to be no sheltered spot on the west coast of Ceylon suitable for pearl oyster cultivation. Some of the bays in Trincomalee harbour might prove suitable, and if so, they would be, I believe, the only places likely to be found for this experiment in Ceylon. The late Dr. Kelaart succeeded in taking pearl oysters from Sillavaturai in chatties round to Trincomalee, and in keeping them alive for some time after.

In connection with this subject the question arises whether or not, in the event of pearl oysters being successfully reared in shallow water, it would be necessary to lay them out in their natural beds to produce pearl. During a visit I made in 1867 to the edible oyster preserves on Hayling Island near Portsmouth, I was informed that it was necessary, when the young oysters had attained an age of one year or more in the preserves, to lay them out on their natural beds to fatten, and this might be found necessary also in the case of pearl oysters for the purpose of producing pearls. The native headmen who were employed at fisheries and inspections of the pearl banks years ago, declared that oysters found in shallow water never contained pearls, and that only those found in deep water were of any value. I have not had an opportunity of testing this theory; but if it is correct, then any scheme of pearl oyster culture attempted hereafter would have to contend with the risk of young oysters, after transference to their natural beds, being at the mercy of their enemies, almost as much as they are now; and in that case, Trincomalee would be too far away from the beds in the Gulf of Manaar, as the cost of transference of the large number of young oysters required to produce a fishery would be prohibitive, even if found feasible. There are no known pearl oyster beds on the east coast of Ceylon. The headmen's theory is, however, supported by the fact of a bed of pearl oysters on the Kondatche Paar being abandoned in 1855, owing to the oysters being unremunerative in pearls. This bank lies in 3 to 3½ fathoms water, three miles from the shore.

The following quotation from Mr. Edgar Thurston's Bulletin No. 1 on Pearl and Chank Fisheries of the Gulf of Manaar, 1894, is significant:—

"The artificial cultivation of the pearl oyster was attempted some years ago in a nursery made in the shallow muddy water of the Tuticorin harbour without success; and in his final report to the Ceylon Government, Mr. Holdsworth expresses his opinion, with which I thoroughly concur, that there is no ground for thinking that artificial cultivation of the pearl oyster can be profitably carried out on the Ceylon coast, as the conditions necessary for the healthy growth of the oysters are not to be found in the very few places where they could be at all protected or watched."

Discussion.

Mr. Haly on being called upon to speak, remarked, that he knew nothing more about the Pearl Oyster—nor did he take any special interest in it more—than any other invertebrate of the great Indo-Pacific Fauna. As to its migrations it shares that habit with numerous species of widely different classes. Last year, he accompanied Professor Gooderich to Trincomalee in hopes of obtaining certain species abundant there in 1887 and 1890; but although the whole coast and harbour were carefully searched not an individual was procured. In the same way a very large and handsome *Aplysia* or sea-hare and a species of *Melibe* (a most strange and remarkable mollusc) appeared in August and September in Weligama bay; this year the *Aplysia* cannot be found and the *Melibe* is scarce. When he expressed his surprise to Mr. Gooderich at the disappearance of the species formerly so abundant at Trincomalee, Professor Gooderich stated that the same phenomenon occurs on every coast. A scientific inquiry on a large scale therefore, into the Pearl Oyster fishery could not fail to beof great benefit to the Museum as tending to throw more or less light on the habits of numerous species of widely remote classes.

H.E. the Governor next called on Mr. Ferguson, who said:—I suppose it is because I am the oldest member on the roll of the Society in Colombo that I have been asked to propose a cordial vote of thanks to Mr. Collett for the interesting and extremely useful paper he has read to us this evening. In any case it gives me very great pleasure to comply with the request. It is interesting to note that from time immemorial, there have been fisheries of Pearls and Pearl Shell all round the Indian Ocean, on the African, Asiatic and Austral coasts—from Mozambique to the Red Sea and Persian Gulf, to Karachi, the Gulf of Mannar—the Tinnevelly and Ceylon coasts—the Burma coast at Bahrein—the Saigon, Philippines and Bornean as well as Chinese coasts and up some of the Chinese rivers, and also round one-half of Australia. Our Ceylon fisheries are among the oldest and most famous, seeing that a European visitor found 8,000 boats at work about the middle of the 14th century. But then in the Book of Job, some 3,500 years ago, there was mention made of both "coral and pearls." In Europe,

pearls of value have been got from the mussels fished in our Scottish rivers—the pearls in the Scottish Crown now forming the regalia of Great Britain were all got in the Tay and the pearls gathered there in three years (1761-1764) were valued at £10,000. A fine pearl similarly found in the Conway is said to be in the Royal Crown of England. Now remembering that the Scottish mussel is allied to the so-called Ceylon pearl oyster, it will be seen that pearls can be cultivated in quiet river estuaries as well as in the deep water on Ceylon banks, and in the case of Australia inside the barrier reefs.—I have taken a special interest in this question of Pearl Oysters and their Culture ever since I visited Western Australia in 1875. Sir Wm. Robinson, a brother of Sir Hercules, was Governor there and he kindly put all available information about the local Pearl Shell and Oyster fishing, then in their infancy, at my disposal. I met the gentleman who first discovered that the blisters on the inside of the large pearl shells contained fine pearls, of a golden yellow or white colour, some of which were valued up to £1,500 each; while one cluster known as the "Southern Cross" was valued up to £10,000. Captain Donnan may be surprised to learn that in those early days so plentiful were the oysters within the barrier reef on the west and north-west coast of Australia that the pearlers simply waded in and pulled up from the reefs in shallow water an ample supply of large oysters, some of them with very fine pearls. This fact is also mentioned by Saville-Kent; but the case is very different now, all the fishing being in deep water—only it seems to show that such oysters flourish and develop pearls even in comparatively shallow water. The readiness with which pearl oysters adhere by their byssus is shown by some 40 being found on a single Pinna or Razor shell and by Mr. Saville-Kent's experience of their growing above a mangrove swamp off N.-W. Australia. There is great encouragement, too, for culture when we know that the happy little family for which each oyster prepares a dainty home numbers, on an average, as many as 12 million eggs and this when the parent is but one year old. An English dramatist has told us that "an oyster may be crossed in love," but there is ample margin to go upon; and our little *meleagrina* is most enterprising and able both to climb a wall and take a walk, justifying that other poet of "the Walrus and the Carpenter" when he said:—"Oh, oyster come and walk with us." (Laughter.) I trust therefore that the step taken with so much promptitude and public spirit by Your Excellency and approved by the Secretary of State, in referring Sir William Twynam's Report for the highest scientific opinion in England, may result in a Scientific Mission of Enquiry and Experiment. Professor Ray Lankester would seem to be a little unjust to Mr. Holdsworth who signed himself F.L.S., F.Z.S., and who first showed us the difference between certain pearl or pearl-shell yielding oysters. But it was a fact that Mr. Holdsworth had never seen a fishery or even a bank covered with our oysters; and therefore there was much reason to hope that Professor Herdman, F.R.S,—if he came out, now that he and the scientific world knew so much more than in the "sixties," and especially if he had the help and experience of our expert, Capt. Donnan, and was also lent the aid of Dr. Thurston by the Indian authorities (who ought to be asked to join in the Mission with Ceylon)—would be able to give us results worthy of his high reputation and keen powers of observation. There was a great deal of literature, including accounts of Pearl Fisheries and Experiments, to be collated—there might even be later Reports in reference to Californian and Central American Fisheries, than Mr. Collett or himself had obtained;—but not the least interesting contributions to place before Professor Herdman would be both the valuable papers read that evening, and Mr. Collett by introducing the subject and giving the Society so good a paper, had laid the members and the whole intelligent community of Ceylon under a debt of gratitude for which he deserved the cordial vote of thanks he thus proposed with great pleasure. (Applause).

DR. VANDORT:—I have much pleasure in seconding the vote of thanks to Mr. Collett, for the very interesting paper he has just read to us. Although it professes to be only a *resumé* of information derived mostly from sober scientific journals and statistical reports of a not especially enlivening nature, it has nothing of the *dry-as-dust* character traditionally associated with scientific papers, but reads more like an article intended for a popular monthly than a contribution to a staid scientific journal like ours. To some extent, no doubt, he has been inspired by his theme which appeals to so many interests,—historic, poetic, economic, and even political over and above its scientific aspects, and has even allowed himself to subordinate the instincts of the born naturalist to the demands of literary art—as for instance in sandwiching the only technical portion of his paper—not the least important from a scientific point of view—between a quaint disquisition on the right of an oyster to be called a fish (reminding one of Baron Cuvier's famous criticism of the French Encyclopedist's definition of a crab)—and an interesting speculation on the folk-lore relating to the origin of pearls. I, for one, was hoping that while in this mood he would, even while accepting the ugly theory (if scientifically established which I doubt) of the parasitic origin of pearls, have protested against the scientific barbarity, which has no excuse, of robbing the pearl oyster,—our Ceylon oyster,—of its legitimate time-honoured beautiful Greek name, associated with a thousand poetic legends and at least one great Biblical illustration, and substituting for it a vile, inappropriate Latin term, which means, not only *painted* and *coloured*, but false and counterfeit. But like a true Englishman, it is the commercial, practical aspect of the subject which has engaged his attention, rather than its æsthetic side, so I am not surprised to find him strike the key note of his paper in the introductory announcement, that since Diamonds like South African shares are going up, the Ceylon Government and the Ceylon Public had better look after their interests in local fisheries, as Pearls are sure to follow suit. After such a warning, it is hardly necessary to say, that in the selection of his scientific facts, he has *collated* them (if I may be excused the term) so as to keep in view all those that are likely to be of general interest and eschew what would be technical and comparatively uninteresting. I should have wished, however, he had given the natural history of the bivalve he had selected for his subject, a little more of his attention on the paper he has read to us, as no one could have dealt with it better with his extensive reading and special researches in this section of Natural Science. I have no intention of detaining the meeting at this late hour and shall therefore confine myself only to one or two points of practical importance, on which I shall be glad to be enlightened by Mr. Collett. The first refers to the question mooted originally by Dr. Kelaart in his Report of 1857, are oysters monœcious or diœcious—in

other words, are the two sexes found in separate individuals, or are they all female or hermaphrodite capable of breeding by self-fertilisation. Now, according to Dr. Kelaart, who is universally acknowledged to be the highest authority on the subject, there is no proper distinction between the two sexes, except in the contents of the *ovarium* or egg-bag, which in 97 or 98 per cent contain *ova* at all stages of growth even from birth, and only in one or two per cent contains the fluid essential for cross-fertilization and no ova at all. These oysters then represent the male individuals, though there is nothing in the external coat, or internal structure to distinguish them from the others. The practical importance of this fact comes in with the light it throws on a possible frequent cause of the disappearance of oysters from old oyster beds. For, if cross fertilization be essential to the production of a healthy progeny as Darwin has established and large colonies of such progeny growing together are necessary to form a productive "band,' as Kelaart has shown, the destruction of the few males by any accidental cause, may suffice for the extinction of an entire bank of oysters. Mr Collett himself to whom I referred this point before the lecture was good enough to explain to me that he believed that the female oyster has it in her power to change her sex, as often as she chooses, a wonderful fact, if it be the case; only it is to be hoped that Nature has limited this marvellous power of self-transformation to the oyster, which exceeds, I think all that the new woman with all her claims for woman's rights could imagine in her wildest dreams. But I believe even Mr. Collett is not quite sure on this point, so that one of the most important problems connected with the life history of this bivalve still remain to be solved by science. Another point on which I should wish to be enlightened by Mr. Collett is with regard to the formation of pearls. He has given in his adhesion to the parasitic theory and even quotes Dr. Kelaart in support of it—but a careful reading of Dr.Kelaart's reports, both of '57 and '58, seems to me to show that while he only countenanced the parasitic theory as accounting for exceptionally, as it were, the formation of pearls in some cases, he never abandoned his original theory made from actual observation that the true nuclei of true pearls are the ova of the pearl oyster itself as a rule, and only exceptionally the ova of parasites that enter its body with its food, while only inferior and irregular false pearls result from the artificial intrusion of particles of sand, etc., to serve as nuclei. So far as my reading goes Dr. Evarard Home in the last century was the first to advance the theory of abortive ova being the nuclei of pearls, and Dr. Kelaart at first accepted it with a modification by saying that it was not the ova which are left behind in the *ovarium* but those which escape through the over-distended coat of the egg-chamber, when it ruptured as it may easily do near the hinge, when they would bury themselves in the interstices of the mantle and so become the nuclei of pearls. But in his later report of 1859 he says he was so fortunate as to find an entire ovarium charged with no less than 32 pearls, and still another which he did not open, but which appeared to contain as many more—thus completely confirming Dr. Home's theory. Both these specimens he sent to Dr. Owen, and are now to be seen in the Museum of the College of Surgeons in London. How, or whence the *nacre*, or pearl-lining substance was formed for these pearls in the ovary, Dr Kelaart would not or could not determine, but he supposes with great probability—what science at the present day can easily confirm—that the ovarium membrane can secrete it. For it is a curious circumstance that human pathology affords analogous illustrations, both of abortive ova and even embryos becoming the centres of new and varied forms of all growth—and sometimes of concretions of an intensely hard character known as lithopadia—but still more curiously that the lining membrane of the ovary from which proceed these metamorphosed but unimpregnated ova sometimes secretes the most extraordinary structures such as bones, teeth, hair &c., without any trace of embryonic formation, which may even grow from the ovary of the embryo itself, and become serious pathological tumours in after-life, It is unnecessary for me to point out the bearing that this theory of Dr. Kelaart's has on the proper method of oyster culture. Entirely opposed as it is to that now proposed, based on the theory that conditions which favour the entrance of parasites which foster disease are the best for pearl formation. In conclusion, I am sure that Mr. Collett will do Dr. Kelaart the justice to acknowledge that although there may be no ponderous monograph in any language on the natural history of the oysters—and a great book, according to the great proverb, is not seldom a great evil,—his reports on the subject, though written nearly 50 years ago, are as complete as far as they go on the subject as could be desired. There has been little that is new that has been discovered by naturalists since, to supply the desiderata Mr. Collett refers to in his paper. I say this, because I do not think Ceylon has sufficiently acknowledged the debt of gratitude she owes Dr. Kelaart for his researches, in connection with the Ceylon Pearl Oyster. One of the earliest sons of the soil—belonging to the Burgher community, who having secured a British degree, entered the Army Medical Service, where his reputation as a scientist generally—as Geologist, as Botanist, as Zoologist, especially as a Conchologist in connection with the subject of Pearl Oysters—has received the recognition of the whole scientific world. (Applause.)

After the vote had been carried by acclamation, Mr. COLLETT, in rising to reply, said he would like to answer one or two points raised by Dr. VanDort. Firstly, he would refer to Sir W Twynam as regards the pathological and zoological study of the oyster; that authority said that our knowledge in this respect was still almost nil. His own paper had been entirely theoretical, summarising the latest writings on the subject, and he (the speaker) had taken it up more as a zoological recreation for a busy planter than with any scientific experience of the subject. Dr. VanDort had expected him to put into the paper more than he (Mr. Collett) had intended. He was very gratified at the reception his paper had received; he could feel that if it had done nothing else, it had elicited a most interesting discussion and he thanked them all for their cordial vote of thanks. (Applause).

The BISHOP OF COLOMBO proposed a very hearty vote of thanks to His Excellency for occupying the chair that evening. In any assembly of the inhabitants of Ceylon they were very much pleased to have the Governor with them and the members of that Society felt that in a particular degree. They were very grateful to His Excellency for having made the effort to come out on that wet night. Cynical outsiders might say that a meeting of the Royal Asiatic Society would be the very place to come to on a wet night, because they would be sure to find something dry. (Laughter.) Such a person would have been hopelessly wrong, on an occasion like that evening. He was not aware to what extent His Excellency gave a personal study amidst his many vocations to those matters which particularly occupied them as a learned Society, but it was quite certain that in one branch of their proceedings H.E. encouraged them by his presence that evening as in that part of their proceedings in which they tried to lay or develop that scientific basis upon which alone could be soundly erected any structure of utility in any work, especially of production of any kind. And their Governor had shown them by the interest that he had taken and the efforts he

had made for promoting the scientific side of agriculture and providing a scientific staff for placing upon the most sound basis the great industries and productions of the Island, that he recognised what a Society like that tried to teach, what they were trying that evening and on all similar occasions to teach to the people of Ceylon, *i.e.*, that only upon a thorough scientific study of the facts and the natural laws that commerce and production and works of usefulness can be well conducted. (Applause.) They were very glad that H.E. should be amongst them on such an occasion and that they should have such support. There were many times when their papers dealt with matters, the utilitarian tendency of which could not easily be discovered. (Laughter.) The Society existed in a great measure in order to keep before the minds of men that knowledge was valuable for its own sake. There were also times when the bearing of knowledge, scientific knowledge in particular, upon the practical needs of men and Governments came within their purview and on such occasions they were extremely thankful to have the presence of their Governor. (Applause).

Mr. S M BURROWS said that, while he felt a strong sense of his unworthiness for the task, he congratulated himself on the honour done to him that night in his being asked to second the vote of thanks to H.E. the Governor for being present that evening. He said that His Lordship and he had often met on various boards that arranged no doubt adequately for the instruction of others. It was strange that they should thus meet on an occasion when arrangements had been made no doubt equally adequately for the instruction of themselves. (Laughter.) He came to the meeting that evening knowing about as much of the pearl oyster as he did of Chinese, and he went away feeling he could pass a very fair examination on the many scientific aspects of its study—from the highly technical terms so glibly mentioned by Mr. Collett to the case of the "oyster crossed in love" so unexpectedly brought in by a later speaker, Mr. John Ferguson. He begged to second a very hearty vote of thanks to His Excellency for presiding, a distinction which had heightened the interest of the gathering that night.

H.E. THE GOVERNOR.

HIS EXCELLENCY, in returning thanks, said: I am extremely obliged to you—to you, my Lord, for the gracious terms in which you have proposed; to you Mr, Burrows for the kindly terms in which you have seconded; and to you, ladies and gentlemen, for the cordial manner in which you have passed this vote of thanks which is in no way merited by me. It is a great pleasure to me to be present at the meetings of this branch of the Royal Asiatic Society, and I only wish my duties would permit me to attend more frequently. Perhaps on occasions when you are having a learned and scientific discussions I might feel like a fish out of water or to use a more appropriate simile, an oyster off its bed. (Laughter). But when this Society is assembled to discuss an unusually utilitarian question, how to conserve, how to protect and how to advance one of our great industries I feel more at home. Nevertheless I must confess that it was with conflicting emotions that I learnt that the paper today was regarding Oysters and how to conserve them. (Laughter). A poet of old,—Virgil, I believe—Mr. Burrows will correct me if I am wrong—said there is no one more bitter than a beautiful woman whose charms have been spurned. (Laughter). There is here no lady who has been in that unpleasant position; but my charms have been consistently spurned by the Oyster since I assumed the administration of this Colony. (Laughter). And yet no man was more kindly disposed to the Oyster than I was when I landed here. (Renewed laughter). I looked forward keenly to making his acquaintance and anticipated the great advantage that would follow upon such intimacy. (Laughter.) Indeed I may say that I built castles in the air, at any rate on his shells I built many a railway and many an irrigation scheme. (Laughter). Unfortunately I have been persistently boycotted by the Oyster. (Renewed laughter). And now my feelings towards the Oyster have greatly changed and I begin to remember that he has always been hostile to me personally—that I have never taken an Oyster that has not disagreed with me. (Loud laughter). Altogether I begin to look upon the Oyster as a capricious, deceitful fish or mollusc or, as Mr. Haly expresses it, an invertebrate creature. (Laughter). These being the feelings I entertain towards the Oyster when I was called upon to consider measures not for its destruction, but for its conservancy, I was greatly perplexed. (Laughter). It is difficult for a just man to satisfy his own private vindictive feelings and do his duty as Governor of the Colony, but happily the difficulty no longer exists. Thanks to Mr. Collett these conflicting feelings have been reconciled because he tells us that the pearl is a pathological product; that is to say, only disease in the dying oyster can produce the pearl and therefore what we call the Conservancy of the oyster is only to produce those unhealthy conditions of life which will make it diseased or dying (Laughter). Under those circumstances I am one with you all in your desire to conserve the Oyster. (Laughter and applause). Joking apart, I think this talk on our fisheries will not be without its advantages if it has induced us to consider and reflect whether more scientific treatment, more scientific procedure could not be adopted than that of two or three thousand years ago. Dr. Haly is not, but no doubt ought to be a member of the Legislative Council:—if he had been he would have known that that wise and sagacious and far-sighted entity—the Hon. Treasurer, who is present will bear me out in describing it as such,—the Government of Ceylon (laughter) has already taken up the matter and has approached the Secretary of State, and through the Secretary of State the learned Societies and the learned Professors of these Societies, on this subject and that from two learned Professors—Professor Ray Rankester and Professor Herdman—we have had two very valuable reports. Professor Ray Lankester, as is the way with some scientific men, has, to use a vulgar term, opened his mouth too wide. (Laughter). He has seen the opportunity of enriching the scientific world at the cost of Ceylon and he has proposed a costly mission which will no doubt collect much valuable information which would not only be to our advantage, but to the advantage of all Oyster-bearing countries. Therefore I think Mr. Ferguson's suggestion is a good one that the cost of such a mission might be divided

between those countries interested—India, ourselves, and others; but if such co-operation is not possible then I think we might adopt a middle course such as Mr. Ferguson also suggested and get Prof. Herdman if he can spare his valuable time to come over here and in collaboration with Captain Donnan, our great practical expert—they will be, I am sure, able to give us some very valuable information especially regarding that interesting question—the life history of the oyster. Ladies and gentlemen, I think we must all feel very grateful to Mr. Collett for the very interesting paper he has read. He said it was his zoological recreation. To us it has not only been a zoological recreation but zoological instruction, and I think we are much indebted to him for this practical and useful discussion which has followed the reading of his paper. I thank you again for the very kind way in which you have received it. (Applause.)

At the close His Excellency shook hands with Mr. Collett and Captain Donnan, and inspected all the illustrative objects displayed around the table. He evinced considerable interest in the diving apparatus exhibited by Captain Donnan and the specimens of pearl shell which had been laid out The audience was some little time in dispersing even after His Excellency had left.

To Capt. Donnan, Mr. Collett and Mr. Gerard Joseph belongs the credit of adding much to the interest of the meeting by the display of these "curios" as well as utilitarian displays connected with Pearl Fisheries. A section of a pearl was under a powerful microscope; a display of different kinds of oysters including the largest "meleagrina" from Australia; copies of Mr. Saville Kent's large and profusely-illustrated books and other literature were made available and suspended at one side was an ample object-lesson of the mode in which the native diver did his work for Capt. Donnan, with stone held by coir ropes, place for his foot, the coir basket in which to gather the oysters, &c. The diving apparatus was mainly of coir and consisted of a rope with a heavy lead weight attached, beside a receiving basket of coir (in shape like an inverted tam-o'-shanter) into which the oysters were placed by the diver; as many as 100 pearl oysters could be placed in the one basket at a time.

The function terminated shortly after 11 p.m.

SNAKE BITES AND ANTIDOTES.

The following from the paper on Snakes by Dr. Gunther, of the British Museum, in the *British Encyclopedia*, is worth reproducing:—

No antidote is known capable of counteracting or neutralising the action of snake-poison. Some years ago injections of ammonia or liquor potassæ were recommended, but there is the obvious objection that hardly in one out of a thousand cases of snake-bite would either the appliances or the operator be at hand. Fayrer's experiments, however, have distinctly disproved the efficacy of this remedial measure. Equally useless is permanganate of potassium; it is indeed true that a solution of this compound destroys the properties of snake-poison when mixed with it; and therefore such of the poison as remains in the wound will be neutralised by the external application or injection of the permanganate, but the remedy is entirely without effect after the poison has passed into the circulation. Treatment is therefore limited to endeavours to prevent by mechanical means the poison from entering the circulation, or by chemical agencies to destroy or remove as much of it as possible that remains in the wound, and to save the patient from the subsequent mental and physical depression by the free use of stimulants. Whatever is or can be done must be done immediately, as a few seconds suffice to carry the poison into the whole vascular system, and the slightest delay diminishes the chances of the patient's recovery. Courageous persons badly bitten in a finger or toe are known to have saved their lives by the immediate amputation of the wounded member. To the mode of treatment summarized by Gunter* but little can be added. (1) If the wound is on some part of the extremities, one or more ligatures should be made as tightly as possible at a short distance above the wound, to stop circulation; this is most effectually done by inserting a stick under the ligature and twisting it to the uttermost. The ligatures are left until means are taken to destroy the virus in the wound and other remedial measures are resorted to, or until the swelling necessitates their removal. 2 The punctured wounds should be enlarged by deep incisions, to cause a free efflux of the poisoned blood, or should be cut out entirely. (3) The wound should be sucked either by the patient or some other person whose mouth is free from any solution of continuity. Cupping-glasses, where they can be applied, answer the same purpose, but not with the same effect. (4) By cauterisation with a red-hot iron, a live coal, nitrate of silver or carbolic or mineral acid, or by injections of permanganate of potassium, the poison which remains in the wound can be destroyed or neutralised. Ammonia applied to the wound as a wash and rubbed into the neighbouring parts is likewise undeniably of great benefit, especially in less serious cases, since it alleviates the pain and reduces the swelling. (5) Internally, stimulants are to be taken freely; they do not act as specifics against the virus, but are given to excite the action of the heart, the contractions of which become feeble and irregular, to counteract the physical and mental depression, and to prevent a complete collapse. Brandy, whisky, and ammonia in any of its officinal forms should be taken in large doses and at short intervals. The so-called "snake-stones" can have no other effect than, at the best, to act as local absorbents, and can be of use only in the very slightest cases.

Elsewhere he says:—

"Certain stones reputed, on insufficient grounds, to possess efficacy as antidotes to snake-bites are known as snake-stones."

ANTI-VENOMOUS SERUM.

(Prepared by Dr. A. Calmette.)

INSTRUCTIONS.†

The antivenomous serum is serum taken from an ass or a horse immunised against venom of snakes. It will retain its effects if kept in as cool a place as possible, away from day light and without taking the phial out of its box. At or above the temperature of 50° Cent.—122° Fahr.—the serum becomes inactive. Its preservation has been guaranteed by adding a very small quantity of camphor.

Preventive Power.—The preventive power of the serum is, at the least, of 10,000 *i.e.*, it is sufficient to inject rabbits preventively with a quantity of serum equal to 1/10,000th of their weight

*Reptiles of British India, London, 1864, 4to.

† Referred to a week ago, but held over daily owing to continuous pressure on our space.

to enable them to bear, one hour afterwards, without their being intoxicated, a dose of 1 milligramme of dry venom of *cobra capella* of medium activity, said dose sufficient to kill proof rabbits in less than four hours.

Therapeutical Action.—If injected in sufficient quantity to persons bitten by snakes, the anti-venomous serum will prevent the effects of the venom providing intoxication is not too far advanced. It must be injected as soon as possible after the bite. Generally its intervention is still very efficacious an hour and a half after the bite with adults who rarely die but three hours after the bite of the most dangerous species of snakes.

The serum is active against the venom of all species of snakes existing in the ancient and new world. It has been experimented with the venoms of the *cobra capella* and *trimcresurus* of Asia, the *naja haje* and *cerastes* of Africa, the *crotalus* of America, the *bothrops* of the West-Indies, the varieties of *pseudechis* and *hoplocephalus* of Australia and the *vipers* of Europe.

The dose to employ varies according to the species of the biting snake, the age of the person bitten and the time of the intervention.

Generally 10 cubic centimeters are sufficient for children under 10 years and 20 cubic centimeters for adults. However, when the bite comes from a very dangerous species, such as the cobra capella, the naja haje, the crotalus, the bothrops of the West-Indies, it will be prudent to make one single injection at first of a double dose.

Treatment of Venomous Bites.—The first precaution to take is to surround tightly the bitten limb as near as possible to the bite and between the latter and the trunk, with a strip or handkerchief.

The wound will have to be washed with a solution of hypochlorite of lime diluted to 1 gramme for 60 of water previously boiled, titling between 0 lit. 800 to 0 lit. 900 of chlorine per 1,000 cubic centimeters.

The dose of serum must be injected in the subcutaneous cellulary tissue in the right or left side of the belly, and with the usual antiseptical recautions.

Then, with the same syringe, 8 or 10 cubic centimeters of the solution 1/60 of hypochlorite of lime will be injected altogether, but in the different parts surrounding the bite and in the passage of said bite. These injections are intended to destroy, there, the venom which has not yet been absorbed.

From that time, the strip can be taken away from the limb; the patient must be frictioned and coffee or tea be administered, and he be covered warmly so as to provoke an abundant perspiration.

The administration of ammonia or alcohol must be avoided; it would only be injurious both to the patient and to the treatment by the serum.

It is also unnecessary to cauterise the bitten limb either by red iron or chemical substances.

IMPORTANT.—Drs. making use of the above serum are earnestly requested to communicate the results obtained by its application to Doctor A. CALMETTE, Directeur de l'Institut Pasteur de Lille (Nord).—*Pasteur's Institute of Lille.*

MINOR INDUSTRIES: VANILLA; ALOE FIBRE; AND SOAP.

(*Communicated.*)

In the good old days when Coffee was king, the Ceylon planter scouted the idea of making money by minor industries. To have done so would have been to place himself without the pale of civilised society. But the collapse of coffee taught a salutary lesson. Planters are wiser in the present generation; and, so long as the calling be an honorable one, are not fastidious as to the source from which they can derive an income. It has already been shown how valuable an adjunct vanilla would be to the main industry—tea. Another product suggests itself, viz.: Aloe Fibre. There are thousands of acres in Ceylon suited to its cultivation. Once planted it requires little or no attention. Its market value certainly fluctuates considerably, but there is always a margin for profit. At the outbreak of the Spanish-American War it rose to over £30 per ton; its present value is from £22 to £23. The cost of cutting, carriage, gratting, baling, &c., is about R140 per ton—freight and London charges £6 per ton. It will be seen from these figures that, at its present price, there is a profit of about R100 per ton.

Again, with coconut oil at our doors, why are there no Soap factories? With coconut oil as the basis, a good household soap could be manufactured in Colombo for about R250 per ton. For anyone "in the know" there is a fortune in soap-making in Ceylon.

E. H. E.

[And yet our big Oil Mills, that used to manufacture soap regularly, could only find a market by exporting to Calcutta and Mauritius, though we imported about two hundred thousand rupees' worth a year, the figures being R269,340 of soap last year! And now the local manufacture is abandoned.—Aloe-growing has been tried, but the labour of preparing the fibre ran away with the profit, in the case of planters in the Kurunegala and Uva districts. —Ed. *T.A.*]

PLANTING NOTES.

Fatal Snakebite.—The lamentable death of one of Mr. Oliver's Chief Assistant Engineers on the Northern Railway from snake-bite, breaks through the record that for 60 years no death of a European from this cause has occurred in Ceylon. The greatest sympathy is due to the young widow, and other relatives at home. Mr. Ievers should see to it that Jaffna—Hindu temples and all—are cleared of cobras if it be true they are encouraged for some reason. Let a license fee be imposed, and there will be no protection, or a reward be offered for every snake's head brought to the Kachcheri.

Scientific Cultivation.—Ceylon tea and other planters will be interested in the following extract from a letter received by us from Mr. Joseph Fraser:—

"I visited both the Rothamsted and Dalmeny manuring field experiments and found much that was interesting and suggestive. Those directing the Dalmeny experiments are strong on the need of getting the land into condition favourable for the growth and development of the nitrifying organisms and where leguminous crops are being raised, to the conditions, favourable, to the microbes involved, in the fixation of free nitrogen through the root nodules. The whole results are being drawn up for publication in pamphlet form, and form what I gathered when there, the details when worked out will be of great practical value."

Correspondence.

To the Editor.

SNAKE-BITE AND CURE FOR HUMAN BEINGS AND CATTLE.

SIR,—The terribly sad ease of snake-bite resulting in the death of Mr. White of the Northern Railway Extension, reminds us that we should make known as widely as possible such treatment as has been attended with success in cases of bites, from venomous reptiles. In Ceylon we do not hear much of death from snake-bite among the natives (and it would be interesting to discover why this is,) but the return of such deaths in India, for 1899, gave 22,480 for human beings and 3,793 for eattle. Dr. Watt gives the following under the head of *treatment*:—

"Immediately on infliction of the bite, a ligature should be applied very tightly about the limb at a short distance above the wound and several other ligatures at suitable distances further up. The flesh around the marks should be excised freely, the surface of the wound should be scarified, washed and squeezed, and bleeding should be encouraged. The amount to be excised around the fang-marks must depend upou the looseuess of deneseness of the surrounding tissues, aud their consequent tendency to allow the poison to diffuse freely or not. The actual cautery may be applied to the deeper portions of the wound, where the poison may uot have been removed by the excision. Stimulants, such as alcohol or liquor ammonia in 15-drop doses in an ounce of water, may be given, but over-stimulation should be avoided, and during the administration of stimulants, liquid nourishment should also be exhibited (prohibited ?). If depression be marked, mustard plasters may be applied over the heart, on the pit of the stomach, or on the nape of the neck. The patient should be allowed to rest in a well-ventilated room, protected from the sun; in cases where the prostration is extreme, methods of artificial respiration and galvanism may have to be employed. Amputation should at once be had recourse to in cases when the snake is known to have beeu oue of a markedly poisonous character, and the bite is in one of the fingers or toes. In wounds of the larger members or of the trunk where free excision is possible, amputation may not be necessary. The intravenous injection of ammonia or of liquor potassæ do not apparently do much good, but they may be injected freely into the poisoned part. The local application of permanganate of potash is strongly recommeuded by some authorities. Various methods of treatment, all more or less founded on superstition, are employed by the natives of India, and every now and then alleged specifics for the poison of suake-bite have been vaunted, but as yet no antidote is known which is capable of neutralising the action of the poison. The so-called "snake stones" can have no other effect than at best to act as local absorbents. They are for the most part merely pieces of charred bones which by absorbing from the wound the poison charged blood may be of use in slight cases of snake bite."

There are, of course, numerous drugs used among the natives of Ceylon and reported to cure snake-bite, but we are not concerned with these at present, as what we would like to suggest is the use of some common and handy substance, such as chloride of lime or iodine, or other treatment that can be adopted without loss of time, for it is most important that whatever has to be done must be done quickly.

Some time ago we read interesting accounts of Dr. Calmette's work in Paris in connection with the preparation of a therapeutic serum against snake-bite, and this preparation is, no doubt, now procurable for inocculation purposes. But Dr. Calmette himself recommends that in the absence of the serum, chloride of lime is the next best remedy. The Doctor's recommendation is based on a study of the blood of bitten animals. It was found that in such blood the eorpuseles lost their shape and agglomerated; the blood was thus unable to do its work; in other words the fatal results were due to paralysis of the lungs caused by stoppage of circulation by the coagulated condition of the blood. This discovery led to some very interesting experiments with the result that the chemical treatment referred to was found to be efficacious. The chloride of lime should be free from absorbed water, and for use should be taken from an hermetically sealed bottle. One part by weight should be dissolved in two parts of boiling water, but the solution should never be made until it is about to be used. This should be injected subcutaneously with a syringe all around the wound and also under the skin of the abdomen, that it may enter into the circulation as quickly as possible. Dr. Calmette estimates that from 20 to 30 centimetres of the solution will suffice to save the life of a man bitten, it being administered in doses of five-cubic centime each time. Of course time is an important element in the matter.

In conclusion we would quote a passage with reference to Dr. F. E. Brown's eure for the bite of rattle-snakes, which he says he used successfully in his practice in the United States: "I have treated thirteen cases of snake-bite in my practice with simply marvellous results—even restoring life and health when the patient was supposed to be dying. My first cure occurred many years ago. A little child, say three or four years old, was brought home with two ugly gashes on the instep by a fair-sized rattler. I suppose I saw the child about an hour after the bite, with limbs badly swollen and in great pain. I applied iodine to the wound and gave the child drop doses every ten minutes for an hour, then every half hour until decided improvement. The child took 10 to 15 drops in all. Next morning the father reported that the child had perfectly recovered and was playing about as usual. My last cure was about one year ago. A lad about 15 years old, while reaching under some boards for hen's eggs was bitten on his right hand by a large rattler. He was brought to me with hand and arm enormously swollen, 'and scarcely able to stand on his feet. I pursued precisely the same treatment as in my first ease, except that I doubled the dose. He took in all perhaps 25 drops, He recovered rapidly, with no outward results. It is equally efficacious in the treatment of dumb beasts." Dr. Brown here goes on to refer to the cure of a eow which was in a bad way after the snake-bite, which, on his advice, was dosed with 10 drops every 10 minutes for an hour, then every hour for a time. The result was entirely satisfactory even in this case. It would be interesting to know if any of the above remedies have been tried locally, and if so with what success,

INTERESTED,

CACAO IN CEYLON: AND MR. CARRUTHERS.

DEAR SIR,—As Mr. Carruthers' remarks on cacao canker at the N D P A meeting on the the 20th ult. have caused considerable discussion in the press, I send you a copy of a

letter I have written to the "Ceylon Standard" on the subject and should be glad if you could find room for it in an early issue as I think what Mr. Carruthers actually did say, ought to be well understood.—Yours faithfully, E. WEBB.

MR. CARRUTHERS ON "CACAO."

Hindugalia, Peradeniya, Nov. 3.

The Editor "Ceylon Standard."

Dear Sir,—My attention has been called to a leading article in your issue of the 29th ult. headed "Mr. Carruthers on Cacao," which is, I think, calculated to give a very erroneous impression of the matter. In the first place Mr. Carruthers never offered to give a lecture, but, in accordance with the wishes of several members of the N D P A, I, as Chairman, invited him to be present at our meeting on the 20th and to give a short address on plant sanitation in connection especially with the cacao canker which was to be followed by a discussion so that those interested in cacao might have an opportunity of knowing what was being done to eradicate the disease.

During the discussion, Mr. Carruthers, who, by the bye, spent a whole year in investigating the disease and in visiting various Ceylon cacao estates, stated, in answer to a question from Mr. C Gibbon, that *as far as his experiments went* no predisposition in the trees was necessary for the attack of the fungus, but he never said cacao was doomed: in fact he reiterated his opinion that cacao would continue to be a most profitable product in Ceylon, if proper measures were taken, though as in duty bound, he warned planters against the disease.

I think, such addresses and discussions, *especially if properly reported,* should be most useful in keeping us informed up to date as to what is being done both by scientists and practical planters to fight the diseases, cacao and our other products are liable to, and I regret that anything should be said in the press or elsewhere to discourage them.

I should be obliged if, in justice to Mr. Carruthers, you would give publicity to this in your paper, and I must say, I think it much to be regretted that you did not obtain more accurate information before writing the article.—I am, dear sir, yours faithfully.

(Sgd.) EDWARD WEBB, Chairman, N. D. P. A.

MALARIA AND AGRICULTURE.

Nannoya, Oct. 26.

Dear Sir,—The following extract from remarks by Professor Celli (Director of the School of Hygiene, University of Rome) on the Epidemiology and Prophylactics of Malaria, will, I am sure, interest not only "Enquirer" but your other readers too. Under the head "Agriculture and Malaria," the Professor says "It can now no longer be admitted that the simple stirring up of the soil in malarious places determines the liberation of the germs of this infection. On the other hand, any movement which in any way alters the hydraulic conditions of a given area may really become a local cause, predisposing to the development of malaria: marshy vegetation, composed of canes, rushes, water-lilies, cresses and *conferoæ,* is very favourable to the life of the larvæ, and is, therefore, also favourable to and a concomitant of malaria by favouring the existence of the larvæ of *anopheles.* Thus irrigated meadow lands in malarious places, whenever the water becomes quite or almost stagnant in the afferent or efferent channels, and still more rice fields, with their clear and almost still water and typical palustral vegetation, constitute the best habitat of these larvæ. Hence, as is known, the formation of rice fields causes the re-appearance of malaria where it had become extinct and where it already exists, they are a very active focus of reduction."

The article from which I am quoting is a very lengthy one. But the above should suffice to throw light on "Enquirer's" query. Later researches have both modified, but still more, substantiated the professor's thories, and those interested would do well to read through his article fully in the British Medical Journal of Feb. 10th.—Yours faithfully,

GEO. E. P.

PRESERVING COCONUT MILK.

Colombo, Nov. 10.

Dear Sir,—Referring to the article in the *Tropical Agriculturist,* vol. xx. page 342, I beg to say that "Silicic Acid, *i.e.* Quartzose Sand", cannot preserve coconut milk at all, as is said in "Sell's Commercial Intelligencer." I believe the writer of the article refers to "Salicylic Acid", which chemical is often used for preserving wines, beer, etc., notwithstanding it is strictly prohibited in all European countries. I suggest the method of Prof. Sohxlet, viz., sterilising the milk at 212° F. a procedure that is much used for preserving cowmilk for infants. I should think this is also the best way of preserving coconut milk. —I am, dear sir, yours faithfully,

DR. P. W KOLLER.

PLANTING NOTES.

European Plants and Commerce.—In Europe 4,200 species of plants are gathered and used for commercial purposes. Of these 420 have a perfume that is pleasing, and enter largely into the manufacture of scents and soaps. There are more species of white flowers gathered than of any other colour—1,124 in all. Of these 187 have an agreeable scent, an extraordinarily large proportion. Next in order come yellow blossoms with 951, seventy-seven of them being perfumed. Red flowers number 823, of which eighty-four are scented. The blue flowers are of 594 varieties, thirty-four of which are perfumed, and the violet blossoms number 308, thirteen of which are pleasantly odoriferous,—From "*Journal of Horticulture.*"

Planting in Nyassaland.—We have had many good letters from British Central Africa from our well-known correspondent "H. B."—but none perhaps so crisp and chatty and full of the right sort of information as the one we publish elsewhere. "H B" specially points out how some of the surplus of Ceylon "creepers" could not do better than try B.C.A.—easy as A B C, we gather, would be the career before them—for great progress has been made there. The drawbacks however, are hinted at, so that the advice is neither visionary nor unpractical. Further long accounts of "Leopard" and "Lion" experiences by "H B" must be withheld for the present and will probably appear most suitably in our Christmas number.—"H B", gives a list of several Ceylon men now in Nyassaland.

THE CEYLON PEARL FISHERIES: PROBABILITY OF A SCIENTIFIC MISSION.

Mr. Collett's zoological recreations have borne fruit to some good purpose, and the Council of the local Branch of the Royal Asiatic Society, with Dr. Copleston as President, may congratulate themselves on giving occasion for an interesting and profitable evening, but above all for drawing forth the very encouraging utterances from the Chair made by His Excellency the Governor. There is good reason to believe that a local Enquiry and Mission directed by Professor Herdman, F.R.S., of Liverpool University, will be fruitful in useful practical results. He has long devoted himself to Marine Biology and he was selected to conduct the scientific enquiry as regards the edible oyster round the British Coasts with reference to alleged diseases to which it gave rise. No doubt Dr. Herdman has also been a close observer of all that Mr. Saville Kent (who has apparently fallen out of view of the scientific world of late years) learned and did off the Queensland Coast, in Torres Straits and off North-Western Australia in reference to Pearl Oysters, and the Culture of the same both for Pearls and Pearl-shells. He must also have read of Dr. Thurston's enquiries and reports off Tinnevelly and in the Gulf of Mannar and he will have seen how he, as well as Holdsworth, and we suppose Twynam and Donnan, are well-nigh hopeless of the successful Culture or even Conservation of our particular oyster or mussel at any point round the Ceylon or Indian Coasts. On the other hand, he cannot but read with interest of the experiments of Dr. Kelaart—a worthy predecessor of the many "sons of the soil" who have reflected credit on Ceylon by their scientific and intellectual attainments—and then among the rest of his successfully transferring the *meleagrina* oysters from Arippu to Trincomalee; why not, with all modern appliances, establish a successful culture in some part of that sheltered bay? Capt. Donnan thinks deep water essential to the formation of pearls; but Saville Kent did not find that to be the case in Torres Straits or off Western Australia. It may be said he was dealing with a different kind of *meleagrina*; but he successfully experimented up to a certain point, with the small as well as the large kind. And is it too much to anticipate that there may be an interchange between even Australia and Ceylon and India of their several oysters. Why, in fact, should Professor Herdman's Mission not embrace Queensland and Westralia (and indeed South, for North, Australia) as well as India and Ceylon. But if these Governments fail us,—although we are very confident that Lord Curzon at least, will readily respond to any reasonable proposal from Sir West Ridgeway or Mr. Chamberlain,—yet, we think our Governor is right in saying that Ceylon alone even, should not hesitate to engage Professor Herdman, if only the expense is made a little more moderate than was indicated by Dr. Ray Lankester. Ceylon has certainly the largest pecuniary stake. Not a million, but very nearly a *million-and a half* pounds sterling have been received by the British Government from Pearl Fisheries in the 104 years it has administered Ceylon; and it cannot be said that any full and satisfactory Scientific Mission has, so far, ever dealt with the question of Conservation and Culture. Considering the many and varied ways in which pearls are formed—from the fresh water mussel's treasures in Scottish and Welsh rivers, to the unequalled gems found in the meleagrina's of the Gulf of Mannar, and yet again to the large golden yellow or white pearls "faked" or evolved by skilful experts out of the blisters on the large mother-o'-pearl-shell-yielding oysters of Australian waters; and considering also the several extremely interesting and even successful attempts at forming pearls artificially or through the aid of molluscs in Europe—especially in France,—we think there is every reason to anticipate material as well as scientific advantages from such a Mission as that proposed for Professor Herdman, F.R.S., in connection with our Ceylon Pearl-oyster Banks and Fisheries. If it be the case that the erratic molluscs refuse to listen to the charming of our present Governor, charm he never so wisely, and that Sir West Ridgeway may have to leave our shores without ever seeing a Fishery or even seeing a Bank covered with millions of young oysters; yet His Excellency may rest assured that his name will always be associated with one of the most interesting and important Scientific Missions ever arranged in connection with a Ceylon industry,—if we so may term the rich and romantic Pearl Fishery which has made our island and the Gulf of Mannar famous from time immemorial. Surely after reading Saturday evening's proceedings in full, there is no intelligent person in Ceylon who will deny that a Pearl Fishery is one of the most valuable sources of public wealth, and that, as an industry, it demands every attention and encouragement in the direction of judicious conservation and scientific development.

Mr. Elliott's Paper on "Native Agriculture" and its Improvement—referred to in the Legislative Council last month was published in full in the *Tropical Agriculturist* for November. Mr. Elliott draws a distinction between Planting and Native Agriculture: the former, he considers, can be served from Peradeniya; the latter by a reformed Agricultural School to be continued under the Department of Public Instruction. Our objection to this course is that it would not secure the personal interest, attention and responsibility of the Provincial and District revenue officers and their headmen, without which we are hopeless of any real permanent progress being made in the improvement of native agriculture.

STATISTICS OF THE PRODUCTION OF COFFEE IN INDIA.

[The two tables appended state the facts regarding the production of coffee, the first in abstract for the fifteen years 1885 to 1899, the second in detail for the two years 1898 and 1899. It should be noted, however, that the figures, for which the Government are dependent upon the planting community, are imperfect and defective,—planters, for unknown reasons, sometimes withholding information.]

AREA.

At the end of 1899 there were 274,298 acres of land under coffee in India, all, with the exception of 450 acres, in Southern India. The production of coffee is in fact restricted for the most part to a limited area in the elevated region above the south-western coast, the coffee lands of Mysore, Coorg, and the Madras districts of Malabar and the Nilgiris comprising 90 per cent. of the whole area under the plant in India. About 47 per cent of this area is in Mysore, where there were 128,010 acres in 1899, and the plant is grown on 118,514 acres, being 43 per cent of the whole, in the British districts of Coorg (72,296 acres), the Nilgiris, and Malabar (46,218).

In Madras cultivation on an extended scale is practically restricted to the two districts already mentioned and to Salem and Madura. Coffee is also grown in Burma, Assam, Bengal, and Bombay, but in all these provinces on a very restricted scale.

PRODUCTION.

The yield has been very poor since 1896, that of last year being the worst of the series, and representing only about 17¾ million pounds, this quantity being hardly more than half the production fifteen years ago. Though the recent poverty of the crop has been due in the main to adverse seasons in Madras, Mysore, Coorg, and Travancore, the fall in prices since 1897 has removed the stimulus which had been given for a few years to the further expansion of the coffee-growing area, while disease has combined with adverse climatic conditions to reduce the yield.

Taking 100 to represent the area and production in 1885, the ratio of yearly increase or decrease is as follows:—

	Area	Production.			Area	Production.
1885	100	100	...	1893	109	109
1886	97	90	...	1894	117	101
1887	103	109	...	1895	119	115
1888	104	76	...	1896	121	75
1889	110	85	...	1897	116	69
1890	114	63	...	1898	118	68
1891	111	113	...	1899	115	50
1892	110	97	...			

PERSONS EMPLOYED.

According to the statements there were 27,634 persons permanently, and 82,656 temporarily, employed on the coffee estates in 1899, making a total of 110,290 persons, which is equal to one person to about 2½ acres.

EXPORTS AND CONSUMPTION.

The following figures are the average of the ten years ending 1899-1900:

		lb.
Indian coffee	Production	30,092,413
	Exports	30,017,680
	Left in India	*74733*
Foreign coffee	Imports	1,581,171
	Re-exports	735,862
	Left in India	*845,309*

The principal countries to which were shipped the Indian coffee exported in the last three years were (in lb):

	1897-98.	1898-99.	1899-1900.
United Kingdom	12,773,376	17,392,480	17,640,000
France ...	8,607,872	9,356,816	10,847,536
Ceylon ...	293,888	505,680	1,224,272
Austria-Hungary	591,360	1,023,568	298,704
Germany ...	297,584	618,688	292,544
Australia ...	199,024	265,440	272,496
Asiatic Turkey and Persia ...	863,856	131,264	137,984
Arabia ...	630,896	229,488	85,232

PRICES.

Coffee is not sold, as tea is sold, before shipment for export, and therefore there is no Indian quotation of price. The average prices in London for East India plantation coffee since 1874, are here subjoined with their variations, taking the price of 1874 as the datum = 100. Prices dropped last year, as a consequence of the great expansion in the production of Brazilian coffee, to the lowest level known:

	Per cwt. s.	d.	Variation.		Per cwt. s.	d.	Variation.
874 ...	92	1	100	1887 ...	94	9½	103
875 ..	107	4½	117	1888 ...	85	6½	93
876 ...	108	2	117	1889 ...	99	10	108
877 ...	110	0½	120	1890 ...	106	2½	115
878 ...	107	6	117	1891 ...	105	2¼	114
879 ...	100	10	110	1892 ...	104	2½	113
880 ...	99	9	108	1893 ...	105	4½	114
881 ...	91	4	99	1894 ...	101	—	110
882 ...	85	4	93	1895 ...	101	2	110
883 ...	85	7	93	1896 ...	99	11	109
884 ...	76	4½	83	1897 ...	94	8	103
885 ...	75	3½	82	1898 ...	78	1	85
886 ...	79	7½	86	1899 ...	65	2½	71

J. E. O'CONOR, Director-General of Statistics,
September 6, 1900.

PRODUCE AND PLANTING.

TEA: A WARNING.

Some recent comments made on the authority of the Calcutta "Englishman" by the "Globe" of last Saturday are calculated to work a considerable amount of mischief to the tea industry of India and Ceylon. The statement in the "Globe" is as follows:—"If the Calcutta 'Englishman' is accurately informed there is a growing disposition among Indian tea-planters to follow the same suicidal course that brought China tea into such grave disrepute. Until recently, the almost invariable practice in Indian gardens was either to destroy or use as manure the sweepings of the factories. To some extent this rubbish is composed of tea dust, but sand, and even worse refuse, also enter largely into its composition. In some samples subjected to analysis, fully 50 per cent was not tea at all, and the buyer was consequently cheated out of half his money's worth. The same discreditable fraud is said to prevail to an even greater extent in Ceylon, with the result of a downward tendency in prices, both in the colony itself and in the European market. As the sweepings only fetch five rupees a maund—80lb—it cannot make much monetary difference whether they are destroyed or sold. On the other hand, the depreciation of market values, consequent upon the lowering of quality, must involve a serious loss to the whole trade, while sooner or later Indian and Ceylon teas will be ousted from European favour by competitors with better characters. The matter is of such pressing importance that no time should be lost in dealing with it by measures of a sufficiently drastic sort. If nothing less will serve, the Indian and Ceylon Governments will have to prohibit the sale of sweepings under heavy penalties. It is not merely the commercial future of the industry that

is at stake, but the well-being of thousands of natives." It is to be hoped, in the interests of tea growers, that the "growing disposition" here referred to is not general, and that it will be promptly abandoned where it is practised. If the idea becomes prevalent amongst consumers that India and Ceylon teas are losing their reputation for purity it will be a sorry look out for the industry. From inquiries made in London, we are sorry to find that there is some ground for the warning of the "Englishman," although we cannot think that the practice referred to is carried out on a large scale. It would, indeed, be a suicidal policy if rubbish finds its way to market, and surely planters do not need to be told that it would be likely to inflict incalculable injury on British-grown tea, which has hitherto been held in high repute on account of its purity.

Not so Good as it Looks.—Tea growers have been under the impression that tea dealing was a lucrative pursuit, and that in the matter of profits it left the poor grower a long way in the rear. It is quite certain that large sums of money have been made by certain firms who advertise largely, but that prosperity in the tea trade abounds seems to be a delusion, if we may accept the following on the subject from the "Produce Markets Review." This journal, referring to the wholesale tea trade, says: "The great changes in the methods of the distribution of tea during the past few years have had a very marked effect upon the wholesale branches of the trade. Everyone regrets the disappearance of many highly respected firms as a proof of this, and it is well known that those who remain in the business find it a very difficult thing, in some cases, to make ends meet, and in others, to maintain a sufficient return on their capital. When the difficulties commenced a wrong remedy was unfortunately adopted. The wholesale tea trade had been for so many years a very prosperous one, that it was thought that the way to make its prosperity return was, not to cut down expenses, but to add to them, by making concessions to buyers, especially in the length of credit given. The result is notorious in the grocery trade, for while the retailer pays promptly for his sugar and other goods, as in fact he is obliged to do if he is to buy properly, he keeps his wholesale tea house waiting. Another inducement to trade has been to offer special discounts to buyers, which the sellers certainly cannot afford. Such concessions simply add to the crushing expenses current in tea, which are far away and above a reasonable amount, and very much in excess of those in any similar branch of the grocery trade. It appears likely that a crisis is at hand, and that something will have to be done to check the tide of futile endeavours to attract trade at the cost of the seller, who gives away more than his profit in unrecognised additions to his expenses. The only way to increase business is to sell cheaply, but to do this is impossible if expenses are to be still further added to and then lost sight of. Let people openly cut in prices as much as they please, so long as they know what they are doing, but in tea a vicious system of private concessions is ending in the ruin of the wholesale trade without real benefits to the retailer. Indeed, he also undoubtedly loses, if he is a man of means, by the encouragement of people with none, through the lax system of credits."—*Home and Colonial Mail*, October 12th.

PARAGUAYAN FRUIT.

Guava is one of the most abundant of Paraguayan fruits. There are immense numbers of trees throughout the country and women bring the fruit in bushel baskets to Asuncion. It is a round yellow-skinned fruit about as large as a five shilling piece and contains many small seeds. The tree looks like a plum tree and yields about one bushel and a half. The guava season is from Jan. to April and commences again in August. This fruit, says the United States Consul at Asuncion, makes a delicious jelly, clear and light red in colour. The fruit is also used to make paste. Naranjitas, or small bitter oranges, produce excellent preserves. They are about the size of a lemon. The bitter taste is removed by immersion in running water, and the orange entire—skin and pulp—is preserved. This orange is said to hold the flavour much better than the sweet variety. Three years after planting the tree is ready to bear and it sometimes bears twice a year. The lemon, or limon as it is called in Paraguay, is not found in as great abundance as the naranjita, but is also of extensive growth. It is not quite as large as our lemon and is preserved entire like the naranjita. The lemon tree produces from two to three bushels. Aguai is a most delicious fruit, the size of a plum, with two or three shiny seeds. The tree is the size of a large apple tree and yields about four bushels. Many are found in the vicinity of Asuncion, especially in the town of Lambare, also in Campo Grande. Abacaxis is a kind of Brazilian pineapple that has been introduced into Paraguay and grows abundantly. It is very juicy and exceedingly sweet. It is stated by experienced persons in Paraguay that the abacaxis when preserved will retain its flavour and remain fresh for years.—*Journal of the Society of Arts*, Oct. 12.

SNAKE-BITE AND EUROPEANS IN CEYLON.

Our evening contemporary is wrong in saying that no European previous to the sad death of Mr. L F White, Railway Engineer, had been killed by snakebite in Ceylon, that is if Colombo harbour be considered part of the Colony. In the olden days when all the Colombo trade with Europe was done by sailing ships, barques and even brigs *via* the Cape, one of the last-mentioned lying low in the water was climbed by one of our deadly sea-snakes which got up the cable and lay close to a young sailor who was sleeping on deck. The latter towards morning turned round, was bitten and screamed out. His companions saw the snake, and at once a boat was launched and the poor lad taken to hospital; but he died either on the way or soon after arrival there. That, we have always reckoned, was the only authentic case of a European victim previous to this most lamentable occurrence in Jaffna. "Most lamentable," because, clearly, if Mr. White had known what to do, there is a possibility that his life might have been saved. (Each Engineer and indeed new arrival for the Ceylon jungle should have a copy of "Medical Hints" or some such useful pamphlet for guidance.) First there ought to have been a simple, but very tight ligature tied round his arm above the bite; but even before this, or simultaneously, the part bitten ought to have been cut freely with a penknife or razor and the part made to bleed freely. But let us give specific advice on the authority of the late Drs. Elliott and Dickman:—

Snake-Bites.—Pinch up the skin between the finger and thumb and cut out a piece about the

size of a shilling. Be sure you cut out the scratch made by *both* fangs of the snake. If you cannot pinch up the skin, stick a pin or anything else to lift it up; but in any way cut or dig out the piece. Any knife—whether pen or table knife—will answer. Have no fear of the consequence of your cut: there is no artery near the surface that you need be apprehensive of opening. A bandage will therefore stop any bleeding that may follow. Cut, however late, and cut boldly, for life often depends upon your doing so. *Liquor Ammoniæ* in 20 or 30 drop doses should also be given every hour or every two or three hours, according to the urgency of the symptoms. Pain is first complained of in the part bitten, which rapidly extends upwards; pain is also complained of in the belly, aftewards breathing becomes laborious, an impediment in swallowing is felt; and the pulse and respiration become barely perceptible, before dissolution takes place. Spasms are sometimes recognized. Bites from the *Tic Polonga* are sometimes followed by discharges of blood from the stomach.

There have been many narrow escapes of Europeans from snakes in Ceylon: one of the most thrilling was that of the V. A. iu Belihuloya resthouse who found on lifting his pillow in the morning, a good-sized cobra curled round his gold-watch and which had probably been under his head most of the night!—It is truly surprising that poor Mr. White did not at once take some step to deal with the bite on his arm. We trust the warning his case affords will be widely noted.

GOOD NEWS FOR CACAO PLANTERS.

Good news for Ceylon planters of cacao will be found embodied in the "special report" from Mr. H. Hamel Smith given below. Discussing the prospects for 1901, the writer considers an increased supply of the product is necessary, and he is almost certain that prices are to go higher. Considering the careful study which our correspondent bestows on the market and countries of production for cocoa, much reliance may be put on his judgment and estimates. It is true that he points out how higher prices may check the retail trade, and pleads for the maintenance of average moderate rates; but really does it not seem as if the retail prices of cocoa, as well as of tea, coffee, &c., have run too low; and that considering the good wages of the working classes, a little stiffening all round should do no harm? In any case, to judge by the crop and other statistics given, there is encouragement for Ceylon planters to extend their cultivation, if only suitable land and the vigorous, suitable kind of plant are available. North America is fast on the way to become a great cocoa-consuming country; but as Americans cannot get the supply fast enough, we trust that many will turn their attention in that country to good Ceylon tea.

COCOA PROSPECTS FOR 1901.

AN INCREASED SUPPLY NECESSARY.

(By Harold Hamel Smith.)

As far as can be judged, cocoa prospects for 1901 point to the world's supply being larger than this year's, but not equal to the receipts of 1899; yet in spite of this prices are likely to go higher.

In proportion to the supplies received in 1899 it will, I think, be found to work out as 94 against 102, or about ten per cent less. Compared to this year (1900), counting teh year as from January to December, the Guayaquil and African crop will be larger; "Other West Indian," Bahia and Carupano about ten per cent larger all round, whilst in Trinidad, Colombia and Para, I expect to see a decrease.

The crop of the whole of the Island of Hayti or San Domingo, which comprises Samana, Sanchez and Jeremie, is an unknown quantity, and though it has beome an important one, it seems no trouble is taken keep a record of the number of bags that are shipped each year; hence it is often used, like the boy who stands in the centre of a seesaw, to "bull" or "bear" the market, according to the wish of the speculator. By some it is estimated at 50,000 bags, whilst others say that it must be nearly 200,000 bags! Those in whom I have most confidence put it at 75,000 to 80,000 bags. Lately attempts have been made to use the Cuban crop in the same way; but from all accounts this crop will be unimportant for some years to come.

On the other hand although next years receipts are likely to exceed this year's, as I have already said, I believe the average price of cocoa

WILL BE HIGHER.

That is not to say that at times, owing to pressure to sell for financial or other reasons, spells of low prices may not occur; but that at the end of next year manufacturers will find that the average price of the cocoa they have purchased during the year (1901) will cost them, say 4s to 5s, higher all round, than what they paid in 1900,—same as this year it has cost them, I am told, about 7s dearer (71s against 64s), than it did in 1899. A most satisfactory outlook, the planter will say; but if he goes into the matter properly, he will find that it is better for his interest to keep prices more on a parity, say at 72s to 75s for good red Trinidads, than to have it at 85s one year, and at 65s and even 45s the next, and this can only be done by keeping the market sufficiently supplied with the raw material to prevent its being pinched; otherwise the high price will drive a large number of the smaller makers out of the trade, and instead of having as now, more buyers than sellers, there will be plenty of sellers, but only a few buyers.

The reason why cocoa is likely to go dearer next year is not so much that the present rate of increase iu the consumption will be augmented to any unexpected degree; but to the fact that last year manufacturers made very large purchases which enabled them to store up, in their private warehouses of which no returns are published, large invisible stocks, which not only rendered them independent of the market and enabled them to buy only when it suited them to do so but these stocks being an unknown quantity, prevented accurate estimates being made of what raw material there was on hand, and had a depressing effect on the market. By next year

THESE STOCKS

will have run out, or have assumed very small proportions, and to carry on their trade properly, the makers must make them up again, and it is on account of the replenishment of these invisible stocks that I anticipate a higher range of prices next year, for the circumstances under which the sales will be made will be different to what they were in 1899, when the visible supply was 55,000 bags, more than it is now (on 31st August the combined stock of London and Havre was 202,734 bags, against 257,734 bags in 1899) and the sellers uncertain what stocks the makers held.

This year has undoubtedly been a very trying one for makers in more ways than one; for whilst selling prices have not been advanced with drinking cocoas, not only has raw cocoa been high, but the sugar, and with cheap cocoas, the arrowroot as well; even the packages, for this has been a famine year in the paper trade, and the tinfoil have been much dearer. Confectioners and retailers of eating chocolates are already complaining of the rise in the wholesale price of the sweetmeat, and being unable to put up the price retail, their profits are reduced to such an extent that, important as the chocolate trade has become, it hardly pays them to handle. Now this is just what must be avoided if the

CONSUMPTION OF COCOA AND CHOCOLATE

is to go on increasing, for it is to the eating chocolate trade, more than to drinking cocoa, that we must look for any substantial and regular increase in the demand, and there is no doubt that the demand will go on increasing if it is not prevented by the high price of the raw article, which must below enough to leave a reasonable profit to the retailer, and yet let them sell the goods at popular prices. Otherwise the goods will notbe pushed; and as in this world nothing stands still, if you do not push your goods you cannot get on, and therefore, you go back. As to the prospects of the presenc rate of consumption being maintained, if not increased, the following paragraph taken from a book on Cocoa published by the largest manufacturer in America speaks for itself:—"If the increased consumption of the last 37 years is continued until 1934, and that is altogether probable, in view of the fact that cocoa is one of the very few articles which contain all the essentials of a perfect food, the amount of crude cocoa required by this country (America) alone will be nearly

600 MILLION POUNDS."

Hence it is to the interest of every cocoa planter not only to extend his cultivation, but to increase the crop of what he has already got planted, by improved methods of cultivation, manuring, pruning, &c. To make cocoa planting profitable you must be up-to-date in the methods employed, otherwise you lose the increase in the crop, that is part of your profits. and if this increase does not come, and pretty quickly too, there will be a scarcity of the raw material, and though at the time planters may feel elated at the high prices they would obtain, in the end they would suffer, for owing to their want of foresight they would be starving, instead of feeding up, the goose that is now laying them golden eggs.

IMPROVEMENT ON COFFEE CULTURE IN SOUTH INDIA.

(To the Editor "Madras Mail.")

Sir,—I beg to differ with the idea prevalent among some of my brother planters that an acre of coffee in Brazil contains three hundred trees only though planted twelve feet by twelve feet. It is distinctly stated in Laërness "Coffee Culture in Brazil and Java" that in the former country the land is pitted twelve feet by twelve feet, and in each of these pits four coffee stumps are planted, one at each corner of the pit, so that this will give three hundred clumps to the acre; as each contains four trees, this works out 1,200 clumps to the acre. These four stumps being planted so close together naturally make very little growth inwards, that is towards each other, but grow luxuriantly outwards; hence this wide space of twelve feet between the clumps is essential to their healthy growth. If one side of a tree is cut away and kept free of shoots, the other side will make most abnormal growth, and this is what takes place in a lesser degree with the clumps If single trees were planted at twelve feet apart the spread of branch would not be nearly so extensive as that of the clumps; hence a smaller space would be just as suitable, say eight or nine feet. Both in the Brazilian and Leeming's system the trees are left to Nature and attain a height of twelve feet and upwards. Conclusions as to what is the right distance to plant apart cannot be drawn from seeing Mr. Leeming's trees, as these were originally topped at the usual height four feet, and only will it be possible when his new clearings left entirely to Nature, attain maturity. Planters with coffee planted 6 ft. by 6 ft. and who wish to adopt the Leeming system would do well to cut out every alternate row diagonally, which would leave the field 8½ ft. by 8½ ft. In these days, when the borer is committing such havoc in most Indian coffee districts, the fact must not be lost sight of that shade, both from the shade trees and the coffee itself, is inimical to its spread, and that open spaces with its attendant sunlight encourages the pest, also that there are four chances to one against the whole clump being destroyed by borer. I quote from Laërnes the following:—"In the Santos zone, the first step there is to dig a pit from 2 to 2½ palmo square and of equal depth. It is immediately filled up half a palmo with the earth that has been thrown out which the slave presses down a little. Then a mudas stump is taken and placed at one of the corners of the pit, in such a way as to allow the fibres to be spread out. After these have been covered with a little earth, a second is planted and so on till there is one at each of the 4 corners. The spaces left between the plants are not uniform everywhere. According to difference of soil to the physical aspect of the estate and its height above the sea, planters in the Rio zone generally leave spaces of 12 ft. by 12 ft. 12 ft. by 14 ft., 14 ft. by 14 ft. and even 15 ft. by 15 ft. palmos, while in the Santos zone the spaces are 14 ft. by 14 ft. 15 ft. by 15 ft., and by way of experiment during the last 3 or 4 years sometimes 16 ft. by 16 ft. 18 ft. by 18 ft. and over 20 ft. by 20 ft. palmos. It is needless to observe that this method of planting does not produce Brazil single-trunked coffee trees, such as are almost universal in Java, but very wide-spreading coffee shrubs, that is to say a brood of 8, 10 or 20 slender stems branching out from the mudas stump. As regards the height of the shrub, though it is difficult to state an exact average, seeing that the breadth and growth of the plant frequently depend on the altitude of the plantation, yet we may safely assume that in the Rio zone the full-grown

coffee tree is from 8 to 12 palmos high, while in the Santos the standard varies from 10 to 16 palmos." I may here state that a palmo is equal to 8⅝ inches.

Shevaroys. C. K. SHORT.

—*Madras Mail,* Oct. 24.

Sir,—Adverting to "H. W." 's letter in your issue of the 25th instant, I fail to see how, apart from its impracticability in general planting, a greater number of plants than 302 can be got into an acre by conducting the operation in regular hexagons with 12 feet sides, and having a plant in the centre so that all the plants may be 12 feet apart. In a hexagon of this size every two adjacent triangles form a rhombus whose sides are 12 feet by 12 feet, and there are three such rhombic figures in the hexagon, whose superficial area, therefore, is 48 square yards, and this is space just enough for three plants. It will be observed that the centre plant of each hexagon becomes the corner plant of a rhombus 12 feet by 12 feet so that this practically amounts to planting 12 feet apart, only instead of in squares we have the figure slightly altered, but with the same area. I avail myself of this opportunity of correcting an error which crept into my letter of the 18th instant—in it "more light rain" should read "more light and air."

Gudalur. H. H. G.

A SOUTH MYSORE VIEW.

South Mysore, Oct. 26.—The interesting articles in your issue of the 16th, and subsequently, on "The Improvement of Coffee Culture in S. India," have been read with interest by many planters here. The prospect of picking such big crops with so little trouble is certainly a most dazzling one, but I venture to think there is not one planter in this district who is sufficiently sanguine of success, to cut out any of his existing coffee on the mere chance of such a prospect attaining fulfilment. Borer removes quite enough of our coffee trees yearly, and the difficulty of growing supplies, especially on old estates, has become a difficult and expensive matter. It is permissible to think that borer and leaf disease would attack coffee planted 12 feet by 12 feet just as severely as coffee planted 6 feet by 6 feet is now attacked. Shade trees are proved to be an absolute necessity in this district for the protection of the coffee during the drought from December to April and to reduce the devastation by borer to a minimum. This fact alone serves to demonstrate clearly under what entirely different conditions coffee is grown here to the conditions which obtain in Brazil and in some of the other coffee districts of S. India.—*Madras Mail,* Oct. 30.

TEA CLEARING HOUSE.

This Association was formed some years back for the mutual advantage of the wholesale tea trade and of the wharfingers. The institution has proved beneficial in some respects, especially in promoting despatch in the delivery of teas. Instead of the various whole sale houses having to send the documents round to the very numerous wharves scattered along the Thames bank, they are handed in to a central office in Mincing Lane, which saves considerable time, especially as the same system applies also to the returns of the unused portions of warrants to the owners. There is no doubt, however, that the Tea Clearing House, as at present constituted, has become injurious to the interests of a considerable portion of the trade, and particularly to those of the tea planters and importers, and of the home trade. This is because the members, on its formation, agreed only to buy teas lying at certain specified warehouses, while on the other hand non-members were excluded from the benefits of the Clearing House. People were also tempted to join it by being given discounts of 5 per cent off some of the charges, on condition that these were not allowed to other people, such as the retailers who buy tea. We have always objected to the latter portion of the arrangement, as coming perilously near those secret commissions which form such a canker in trade. These discounts have in some cases been recently increased.

The result of the creation of the Clearing House monopoly has been that, while the imports of tea have enormously increased, the warehouses at which it is placed have remained stationary in number. As a consequence, the dock and warehousing charges on tea have been maintained, and they are, as is generally admitted, exorbitant as compared with those on any other commodity. For instance, they are double those on coffee, an article which is dearer on the average than tea in bond. Tea warehousing has also become an extremely profitable business, so much so that it has been embarked upon by syndicates of merchants and others, who have become part proprietors of Tea warehouses, and who import tea in order to obtain the housing. The whole system militates very greatly against the interests of the tea planters, who have, as everyone admits, very great difficulties to contend with without the additional one of a warehousing monopoly in London coupled with excessive charges. No relief can be obtained from the Customs, who at present absolutely refuse to license more bonded warehouses for the storage of tea in London, and who will not receive payment of duty except at the specific warehouses on their list. This acts as a great hindrance to the proper development of the tea trade in London, but while the Clearing House exists in its present form no change can be expected. It is interesting to know that a leading firm of wharfingers has now seceded from the Clearing House, and it remains to be seen whether the trade will or will not re-assert its liberty of buying where it pleases. Tea-growers, importers, and dealers should also be represented in the working of the Clearing House.

The following circular has recently been issued on the subject, and it would certainly appear that the advantages of the Clearing House would be better acknowledged by an annual money payment, than by maintaining a tea warehousing monopoly.

"Tea Clearing House Committee, 21, Mincing Lane, September 27, 1900.

SIR OR GENTLEMEN,—The Committee of the Tea Clearing House beg to notify to you as a subscriber that Chamberlain's Wharf Limited, are no longer members of the Tea Clearing House, and are, therefore, not entitled to its privileges. Having regard to the terms of Rule 14 the Committee have decided, in order to avoid inconvenience to the trade, to suspend that Rule so far as regards teas already purchased by buyers, and now lying at Chamberlain's Wharf, and teas already catalogued for sale at that wharf. I am, your obedient servant, (Signed) G J POOCK, Secretary."

EXTRACT FROM RULES.

"Rule 14.—No subscriber shall be entitled to warehouse or deposit tea with, or employ in connection with tea, any dock company or tea warehouse-keeper who is not a member of the Clearing House, or to purchase or sample any tea from the warehouse of any non-member."—*Produce Markets' Review*, Oct. 6.

MANURING TEA IN THE AGRAS, CEYLON.

This is going to be a bumper year for Mr. Strachan's fine group of estates on the Agras—St. George, Hauteville, &c. Under the very able management of Mr. W. B. Jackson, this group has now reached an average of 800 lb. made tea per acre all over which, considering the elevation, is as good as anything in the island. Mr. Jackson was one of the first to commence burying his prunings, adding some lime, and latterly basic slag. He is a believer also in bones, castor-cake and some sulphate of ammonia. In fact, he has proved the advantage of the mixtures recommended by Mr. Joseph Fraser, for judicious cultivation, and his tea is throughout in very vigorous condition.

ABUNDANCE OF TEAK FROM SIAM.

The teak rafting season this year, at Bangkok, is expected to be one of the biggest on record. The rains have been very heavy in north Siam, and, with the great volume of water in all the rivers, teak that it has been impossible to get out for several years back is now being rafted down. It is confidently expected that long before the end of the rafting season the present high prices for teak at Bangkok will begin to fall.—*Straits Times*, October 23rd.

STUDIES OF NATURE OF THE RUBBER.

It must have occurred to every practical man concerned with the compounding and vulcanization of India-rubber, and thus confronted often with vexatious problems, that the source of much of his trouble might perhaps lie in the history of the material in his hands prior to the date of its arrival at the factory. The removal from a piece of rubber of moisture and foreign substances is comparatively easy; the real difficulty is in the proper appreciation of the mass when nothing but rubber remains. Not even the work of the most expert chemist is a sure guide to whether a certain lot of rubber to-day will yield exactly the same results in manipulation as a lot previously handled, of the same commercial grade and apparently identical in quality.

Undoubtedly the methods or processes of coagulating rubber will yet occupy a more important place in connection with the valuation of this material than has been true hitherto. It appears entirely reasonable that, all things else being equal, a difference in the treatment of two lots of rubber during the process of coagulation might lead to a difference in quality of the product when subjected to treatment in the factory, and particularly in the fabrication of the finer grades of goods. Who can say in how many cases the early deterioration of an article of rubber manufacture has been due, not to a lack of skill or care in compounding or vulcanization, but to the methods or agents employed in coagulation?

It is practically admitted by scientific experimenters with the *latex* of the rubber tree, that the nature of the process which we term coagulation is far from being clearly understood. At least there is a want of agreement as to how this phenomenon occurs, and this amounts to the same thing. If, therefore, it remains to be pointed out how coagulation takesplace, the best coagulating agent for the *latex* of each particular rubber yielding species can hardly be named with certainty.

On another page appears a contribution from a careful student of the problem here referred to—Superintendent Hart, of the Trinidad botanical department—whose conclusions appear to us to merit attention. Naturally, this is a branch of study which cannot be followed in a practical way by the great majority of our readers, but it may serve to interest the factory superintendent, the manufacturer, and even the dealer in rubber goods and the consumer, to know that scientific investigation is attempting to prepare the way for a more intelligent supervision of the preparation of rubber from the initial stage.

A single sentence from Superintendent Hart's paper will indicate that the nature of his studies has a more practical aspect than might at first be apparent to the casual reader. He says:

A sample of *latex* treated with nitric acid in excess, shows that the acid absolutely destroys the rubber contained in it for general use, and deprives it of elasticity and its power of coagulation.

It may be inferred that specimens of crude rubber affected injuriously by the coagulating agent, but not enough to produce the full effect here mentioned, may find their way into the market, and finally to the factory, resulting in the production of decidedly unsatisfactory goods.

Another assertion in the same paper will be received with interest by those planters in America and elsewhere, who have been looking forward to the production of rubber from young cultivated seedlings. It is this:

The difference between *Castilloa* rubber taken from young branches and that from matured stems has been well observed at the Trinidad experiment station.

The latter quotation recalls an article published in *The India Rubber World* of April 15, 1894, by Mr. Francis Harvey, an associate member of the Institution of Civil Engineers, of England, recording his observations in the rubber districts drained by the Orinoco river. He suggested that the quality of rubber produced in some sections had deteriorated as compared with a period several years back, owing to the admixture of the sap of mature trees with that of immature saplings, and also the mixing of the gums from trees of different species, all of which he believed would be found an obstacle to the manufacture of high class rubber goods.—*India Rubber World*, Oct. 1.

SOME TEA PROBLEMS.

An intelligent anticipation of future developments as indicated by the direction of present demands must be a profitable recreation and therefore requires no apology for bringing into print. The planter has today thrust upon him some urgent demands which he must meet if he would survive. There is the demand for economy in expenditure on the production of tea, there is the demand for better quality and a greater proportion of it; and besides these the industry requires some measures to be taken for its future security from wasting blights and diseases. On the proper solution of these problems depends the prosperity of Indian tea-planting, and certain modifications in procedure, are indicated as at once called for.

The first of these in spite of what has been said lately to discount the value of expert advice is to raise a greater outturn from the same area or to keep the outturn stationary on a smaller area. This the experience of Ceylon shows to be possible by the employment of manures, but, indeed, that object lesson was hardly needed to prove the already known value of scientific plant feeding. It is arguable that with manures twice the number of plants could be profitably planted in an acre of land than the 2,000 odd which seems to be the present allowance. What is wanted now is not a large quantity of big leaf, but a numerous progeny of tips. What serves the large Souchong leaf that the market says must hereafter be left on the bushes? The saving of labour in hoeing and weeding and the increased outturn of better quality per acre would very materially affect the general position.

It is also worth while to ask whether the system of pruning now followed will not have soon to be abandoned as radically wrong in principle. I would have tea planted in solid hedges as in the old days and allowed to grow as such. The flat tabular form is, I think, the most unsuited that can be devised, having regard to the physiology of plants. Nature points out the pyramidal form as the proper one. Pruning then should become a process for climination of decadent or inferior growth only, very different from what it is now, and plucking might have to be done on stepladders. Planters who talk of "plucking surface" forget that that surface is never full, and, moreover, the bush would necessarily become just as broad in a pyramidal as in a tabular form, and plucking surface so far as that determines anything would not suffer.

On improvement of quality I hardly think many planters set much store. Quality is a relative term, and all tea said to possess quality only holds that distinction in reference to some other not so good. It follows therefore that in a general improvement the position would not be bettered; nevertheless quality is a fad with many people whom we cannot afford to ignore.

It is very doubtful whether better quality all round would hasten the annual increase in the consumption of tea, and better quality all round would certainly not of itself bring better prices without increased demand at the same time. I am not of those who believe that all the improvements and care of the last 20 years have resulted in deterioration of quality. Most certainly quality has gradually bettered, yet prices have gone down, and the man who says they have gone down relatively as quality has gone backward is not worth arguing with. Much of the China crop is made in the same way it was ever made and under the same conditions exactly, yet there also prices have gone down.

But for progress' sake quality ought to—and I believe does—steadily go forward and upward by slow degrees. The policy of "direct from tea-garden to tea-pot" has much to answer for in keeping down quality. Tea requires time and a great deal of it to mature, and instead of "direct" being a recommendation, it is the reverse. Who that has tasted well-kept tea three years old would give it for tea three months old, or doubt the wisdom of hurrying it "direct from tea-garden to tea-pot." Yet the phrase is a catchy one and for its sake the planter has suffered much in pocket and reputation. Doubtless the planter can improve quality, but only at the expense of a decent volume of crop. With closer planting and forced growth much may, however, be accomplished, and it is in this direction rather than in manipulation in the factory that his efforts will be best rewarded.

All this so far as the tea plant is concerned is striving in an artificial direction, which Dr. Watt tells us involves blight and disease. To combat these by medicaments and decoctions of sorts is futile; when tea can only survive by virtue of sulphur and black soap, we shall be in a bad way indeed. In China 1,500 years of artificial treatment has not hurt the tea plant and can it be said that India has not the means of perpetuating her industry on similar lines? A disease-resisting hybrid is quite possible, and until that is forthcoming we have the old China *jât* itself. The present wants of the tea planting world seem to point to a revival of the China *jât* or its near relatives. Immune from most blights it grows like privet, well nigh impossible to kill above ground; it may be slaughtered, but adventitious buds on the roots rejuvenate the whole plant in a few months. It is an early yielding plant. Hail might be laughed at by the owner of China *jât*; you never come amiss to China, it always has a crop of silver downy tips during the growing season. With China, the planter may at will relax his field supervision, for in no operation can the bush be permanently damaged. The want of size in the bush is made up for by number. Until therefore a hybrid is produced combining the best proved qualities of the indigenous with those of the China, here lies the salvation of tea. In the day which is surely coming when only the extreme tip of shoots will be plucked, the China will be the heaviest cropper, and its leaf weight for weight with indigenous under the conditions, will, when manufactured, bring in more money than the other.—X.

—*Indian Gardening and Planting*, Oct. 18th.

A MONSTROUS BLACK COBRA.

(*From a Correspondent.*)

TRAVANCORE, Nov. 2nd.—It was a revelation to me to hear in the course of last week from a Mahomedan officer of the Government Telegraphs that he saw, one noon, on the public road from Quilon to Shencottah, 31st milestone, a black cobra (*Krishna Sarpom* or *Kari Nagam* as he called it) 30 feet long, 15 inches in breadth, and having a hood which he roughly estimated at 18 inches broad. He and his coolies, who numbered about 60, were working in the jungle when the monster appeared and the men were scared, as they took it to be a mountain-snake which they were afraid would devour them; but when they pelted at it, it could scarcely move, it was so dull and sluggish, due to the fact, as my informant believes, that it had had a heavy meal. But every time that the coolies pelted, it raised its hood and showed that it was a cobra. It was for some time moving forwards and backwards on the road while pelted, not being able to find out a way to escape, but at last discovering a crevice in the parapet wall on the road side descended into the ravine below and dashed off at an enormous speed, which my informant tells me was incredibly fast. He measured the trail of the snake with a tape and satisfied himself that it was 15 inches in breadth. The length he ascertained also with the tape trying to remember, as well as he could, the points on the ground where the snake's head and tail were. This can only be approximately correct, as also the estimate of the 18 inches breadth at the hood. Will your readers enlighten me through your columns, whether they can believe this story? There are specialists on the subject of snakes in Travancore, one of whom is

Mr. H S Ferguson. For my part, I can assure him or other specialists that the Telegraph subordinate, whose name I have taken down for future identification, has no motive for inventing a story of this kind or for wantonly exaggerating what he saw.—*Madras Mail.*

[The easiest thing in the world to exaggerate under the above circumstances and probably the length and breadth were doubled.—Ed. *T.A.*]

PLANTING NOTES.

New Varieties of Cacao.—Those interested in cacao planting will read with much interest the proceedings of the Cacao Committee of the Planters' Association which we publish on another page. Some very practical questions were circulated by Mr. Carruthers, the Government Mycologist and we trust that the result of the experiments that may be carried out will be such as to afford a guide to the prevention of disease and the healthy cultivation of new varieties.

Tea Company Meetings.—We direct attention to the reports of several Tea Companies which we publish elsewhere. Speaking at the annual meeting of the Associated Tea Estates of Ceylon Sir Alexander Wilson, who occupied the chair, gave a very full and clear statement of the position of the Company and pointed out that the directors had come to the conclusion that it was necessary to treat the principal estates more liberally with manure, the expense to be re-couped, it was hoped by the increased yield; and Mr. Bethune also supported the policy of manuring. The Duckwari Plantation has done so well as to enable the directors to recommend a dividend of 7 per cent on ordinary shares. Last month the annual meeting of the Ottery Tea Company was held, when a final dividend of 3 per cent, making 6 per cent for the year was declared; under the circumstances these must be considered satisfactory results.

Planting, especially of Rubber, in Mexico.—Mr. J. C. Harvey sends us an interesting letter on this subject,and especially on the value of land in Mexico. What he tells us about the fertility of the soil and the growth of his Castilloa rubber trees is enough to make Ceylon rubber planters discontented, But there are drawbacks even in the Central American Republic and we cannot have everything. Still at Heneratgoda, in two years, Castilloa trees were 16ft. high and 16 inches round the base of the trunk; and at ten years the largest was 38 inches in girth a yard above the soil and about 50ft. high; while Major Gordon Reeves reported trees at 8 to 10 years old 25 feet high and 30 to 36 inches in girth. The Castilloa likes a stormy climate and deep rich soil: in its native habit at it grows to 180 feet with a girth of 15 feet or 180 inches. All this by the way: Mr. Harvey shows the very different growth on poor gravelly soil. We hope he will write again and tell us about his Cacao and Vanilla as well as the progress of his rubber. One grand advantage possessed by Mexican planters is the splendid market for their produce offered so near to them in the United States—no need to send any produce to Europe.

Rhea Fibre.—An enquiry from an Uva planter the other day led us to enquire from Mr. Manley Power how his Kurunegala experiment with Rhea was getting on. He is good enough to send us, in reply, the following interesting information:—"In reply to yours of 20th, I beg to state that we cut the produce of our seven acres of Rhea fibre and decorticated it. I have just sent home a sample to see what they will give us for it, as we have some two tons of ribbons ready to send away if we get a good offer." We trust the price offered may prove amply remunerative, and so encourage an extension of the enterprise.

Rubber.—The German Consul in Payt-Piara (Peru) reports the discovery of large rubberaorest on the Niera River, a branch of the Amazon. An expedition has been organised to start for the interior to secure the right to collect the rubber. The increasing demand for rubber has drawn attention to the advantages of cultivating gutta—a leading product of Java, and several of the neighbouring islands. A recent number of the "Straits Budget" points out that gutta-percha trees growing wild cannot meet the growing demand which must soon outrun the supply unless gutta plantations extensive enough to meet future needs are laid out. Gutta leaves have been freely resorted to in order to eke out the supply. A company has recently been formed at Batavia to develop this branch of industry.—*India Rubber Journal*, Oct. 15.

Coral Reefs of Ceylon and Maldives, &c.—Mr. Stanley Gardiner's Report which we published in our last issue is a very interesting one and we shall put it on record for reference (in a more correct form) in our monthly periodical. Mr. Gardiner considers the whole of the North of the island as far inland as Dambulla as comprising coral reef areas, and he shows that, undoubtedly, Ceylon and India were formerly connected by an elevated limestone flat as also Jaffna and Rameswaram. What he also tells us of his observations from Bentota southwards, the alternate appearance of coral colonies in the N.E., and their washing away in the South-West, monsoon is of much interest. We sincerely trust that Mr. Stanley Gardiner may be able to resume his observations in Ceylon and the islands to our West.

Manuring and the Value of Cattle Manure.—We direct attention to some useful analyses of different kinds of cattle manure, supplied by Messrs. Freudenberg & Co., (of the Hulftsdorp Mills' Manure Works) and given on another page. Planters cannot fail to be interested in the results given and especially in the summing-up which shows that ordinary cattle manure is really not worth for its chemical constituents. more than R7 per ton, or if there has been no waste of nitrogen—the manure being covered in and otherwise protected—the value may rise to about 12 rupees per ton! This is very little; but do the chemists make a proper allowance for the value of "bulk" in a fertiliser,—for returning to the soil so bulky an article as cattle manure?

THE OTTERY TEA COMPANY OF CEYLON LIMITED.

ANNUAL REPORT.

The Directors beg to submit to the shareholders their report and acconnts for season ended 30th September, 1900.

The crop secnred amounted to 172,956 lb. tea' against an estimate of 160,000 lb., showing an increase of 31,401 lb, over last season.

The tea cost laid down in Colombo cts. 23½ per lb. as compared with cts. 27·31 for year 1898-1899, whilst the nett average price realised was cts. 39·55 against cts. 46·91 last year, and cts. 42·40 in 1897-98.

A sum of R3,019·65 was spent on machinery, of which R579·65 has been charged to expenditure, and R1,183·99 for manure has also been similarly charged, making a total amount of R1,763·64.

Last season R2,827·60 was spent on manure, of which R1,827·60 was included in the ordinary expenditure, the balance R1,000 being paid for out of the Reserve Fund.

After making provision for the interest on mortgage, &c., the balance of profit available amonnts to R24,503·60. Of this amount R8,940 was absorbed by the payment of an interim dividend of 3 per cent to 31st March last, and the Directors now recommend that the amount of R2,440, which has been transferred to machinery account (beiug the balance of R3,019·65 mentioned previously), be written off for depreciatiou, that a final dividend of fonr per cent be paid absorbing R11,920, and the balance of R1,203·60 be carried forward to the next acconnt.

In terms of the articles of Association, Mr. R H S Scott resigns his seat on the Board, but, being eligible, offers himsef for re-election.

An Auditor will also have to be appointed for season 1900-1901.

THE SCOTTISH TRUST AND LOAN COMPANY OF CEYLON, LTD.

ANNUAL REPORT.

Report by the Directors of the Scottish Trnst and Loan Company of Ceylon Limited, to the Twenty-third Ordinary General Meeting of Shareholders, to be held within the Company's Registered Office, No. 123 George Street, Edinburgh, on Wednesday, the 24th day of October 1900, at 2 o'clock afternoon. The Directors present their Twenty-third Report, being for the year to 31st August 1900.

Estates in the Company's Possession.—The yield of tea for the year exceeded the estimate, though the estates, situated as they are in different districts and at different elevations, show varying results. The average yield per acre was 393 lb. While the general average cost of production was redneed, the net average price realised was lower than in the previous season. The return from coffee shows a gradually diminishing quantity.

Factories, Buildings, and Machinery.—During the year additional motive power for Annfield and Sarnia, and the formation of the Government road to Annfield, necessitated considerable outlay. Minor additions to buildings, upkeep of young tea and of fuel reserves, had also to be provided for.

In the current season machinery will be required for Brookside and Sarnia, and an extension of the faotory at Alnwick cannot longer be delayed.

Debenture Debt.—The balauce of the Debenture issue was paid off at the term ef Martinmas 1899.

Mortgages held by the Company in Ceylon.—During the year the Tonacombe Estates Company Limited of Colombo repaid a snm of £1,000 to account of their debentures held by this Company.

Accounts.—The balance at the credit of profit and loss account is £5,827 19 2

And the directors propose to pay a dividend of 5 per cent per annum, free of income tax	£2,250 0 0	
Note.—Two and a half per cent of this was paid as an Interim Dividend at Whitsnnday 1900.		
To pay bonus of 5 per cent free of income tax.....	2,250 0 0	4,500 0 0
Leaving ...		£1,327 19 2

to be carried forward to next account.

Acreage and Cultivation of Estates.—The ol lowing figures may be of interest to the shareholders as showing the extent of the Company's properties and the area under cultivation:—

	Tea.	Young Tea.	Forest and fuel.	Patana and Grass.	Coffee, Buildings, etc.	Total acres.
Alnwick	348	132	234	227	...	941
Annfield,	251	..	28	...	10	289
Brookside,	181	60	35	1½	5	282½
Kaipoogala,	277	2	66	75	..	420
Rahanwatte,	258	21	20	9	..	308
Sarnia,	417	93	130	245	90	975
Total,	1732	308	513	557½	105	3215½

In recording an expression of their appreciation of the services rendered by the Estate Superintendents, the Directors desire to make special reference to the long and valued services of Mr Edward Hope, for many years Manager of Kaipoogala, who died in June last, on his way home, after retiring from the Company's service.

Mr. A Gordon Dickson, one of the London Agents, returned to this country in February last, after a year's residence in Ceylon, during which he visited the whole of the Company's Estates.

The Directors have taken advantage of the presence in England of Mr R S Templer of Messrs. Cumberbatch & Co. of Colombo, and of three of the Superintendents, now on furlough, to discnss with them various subjects relating to the practical working of the estates. A conference with these gentlemen has been arranged, and will be held in Edinburgh previous to the meeting of Shareholders.

The Director retiring by rotation is Mr John Wilson, who is eligible for re-election.

The Directors have, with regret, to record the death of the Hon F J Moncreiff, C.A., for many years Auditor of the Company. The audit of the accounts for the financial year under review was entrusted to the late Mr. Moncreiff's firm, Messrs. Moncreiff and Horsburgh, C.A. The Directors ask the approval of this interim appointment, and recommend the election of the firm as Auditors for the current year.—By Order of the Board, FRANCIS A BRINGLOE, Secretary.

KINTYRE TEA ESTATES CO., LD.

FOURTH REPORT OF THE DIRECTORS

to be submitted at the general meeting to be held on Thursday, the 25th day of October, 1900, at 12-30 o'clock, at the offices of the Ceylon Association in London, 61 and 62, Gracechurch Street, E.C.

The Directors have the pleasure to present the accounts for the twelve months ending 30th June, 1900. The estimated tea crop for the season was 480,000 lb and this was again largely exceeded, the total secured amounting to 540,279 lb or up-

wards of 40,000 lb more than was harvested during 1898-99. The average cost of production was estimated at 26 cents per lb, but a considerable saving on this figure was effected, the actual average cost being 24½ cents, the lowest yet attained by the company. The board think these figures reflect great credit on the management of the company's estates; the profit, however, is less than last year, owing to the lower prices realised for the company's teas, the fall in price being ¾d, the produce of Ceylon estates of a medium and low elevation having generally fallen fully 1 a lb. The net profit amounts to £4,586 6s 5d, and after paying directors' and auditors' fees, &c., income tax, and commission to superintendents, there remains a balance at profit and loss account of £3,961 8s, to which has to be added £121 11s 11d brought forward from last year. The board have paid half-yearly, as usual, the dividends on the preference shares, amounting to £1,000, and an interim dividend of 2½ per cent on the ordinary shares, which absorbed a further £1,125; they have set aside £250 for wear and tear of buildings and machinery (making a total of £1,000 on that account), and they now recommend the payment of a final dividend of 3½ per cent on the ordinary shares (making 6 per cent for the year), for which £1,575 will be required, leaving £132 19s 11d to be carried forward to next year. A sum of £228 16s 5d was expended on the Ayr Estate factory and machinery, and on the upkeep of the 33 acres of young tea which is not yet in bearing, and this sum has been charged to capital account. The sum of £90 17s 8d has been added to coast advances during the year, and the whole of the advances outstanding have been certified by the superintendents to be good and recoverable. The average yield of tea in full bearing was 650lb. per acre, and the gross average price realised in London was 7·03d. per lb., while the average rate of exchange was 1s. 4½d. per rupee. The estimates for the current season point to a tea crop of 521,000 lb., to cost 24.62 cents per lb.—*H. and C. Mail*, Oct. 19.

KORALE TEA ESTATES.

ANNUAL REPORT.

Report of the Directors, to be submitted at the Fourth Annual Ordinary General Meeting of Shareholders, to be held at the Office of the Company, on Thursday, 25th October, 1900, at 3 p.m.

The Directors now submit the Report and Accounts for the year ending 30th June, 1900 which have been duly audited.

	£	s	d	£	s	d
The net amount at Credit of profit and Loss Account after providing the General Expenses is	1,564	2	2			
To which should be added the balance brought forward from 30th June, 1899	169	6	11			
				1,733	9	1
To dispose of which, it is proposed to pay a dividend of 3 per cent. on the perference Shares which will absorb ...	1,436	11	0			
Directors' fees ...	150	0	0			
Expenses of Formation written off	100	0	0			
And to carry forward a balance of	46	18	1			
				£1,733	9	1

In presenting their Fourth Annual Report the Directors regret that though the estimates of crop from all the Estates have been fully realised, and the quantity of tea secured has been considerably in excess of last year's yield the lower range of prices has reduced the earning power of the Company, and they are thus prevented from declaring as good a dividend as last year.

In accordance with the Articles of Association Mr H W BRETT retires from the Board, and being eligible offers himself for re-election.

During the year Mr W S Bennett, the Chairman of the Company, visited Ceylon and reported favourably upon the effective and economical management of the Estates and their good order and condition, and despite the poor results of the past year, the Directors desire to record their appreciation of the services of the Agents and Managers in Ceylon, whose efforts they trust will during the current year be attended with a result more satisfactory to the Shareholders.

ACREAGE OF ESTATES.

	TEA. Over 4 Years.	Over 2 Years.	Over 1 Year.	Under 1 Year.	Chena & Patna.	Fuel.	Forest.	Total.
Riverside	290	—	—	—	88	12	—	390
Glenloch	175½	3	—	—	82	55½	—	316
Karagastalawa	120	58	29	32	81	58	14	392
Wewesse	348	101	106	45	151	3	50	804
	933½	162	135	77	402	128½	64	1902

	Crop. 1899-1900	Crop. 1898-9	Expenditure on Production. 1899-1900 Exchange 1/4 29 64		
	lb	lb	£.	s.	d.
Riverside ...	154,620	151,675	2,329	3	6
Glenloch ..	60,427	60,000	1,265	18	11
Karagastalawa including bought leaf..	82,468	67,965	1,799	16	10
Wewesse ..	95,000	86,547	2,129	3	4

	Cost of Production. 1899-00 d.	Cost of Production. 1898-9 d.	Av. Net Price in London. 1899-00 d.	Av. Net Price in London. 1898-9 d.	Return per Acre. lb.
Riverside ..	3⅝	3⅝	5·28	5·82	533
Glenloch ..	5	5	5·98	6·77	344
Karagastalawa including bought leaf ..	5¼	5⅛			416
Wewesse ..	5⅜	5½	5·79	6·36	273

THE GOOMERA (CEYLON) TEA ESTATES COMPANY, LTD.

DIRECTORS' REPORT.

The Directors beg to submit herewith their Sixth Annual Report and Balance Sheet, for the year ending 30th June, 1900. The accounts, after paying debenture interest and London expenses, show a loss of £173 6s 6d., which amount, when deducted from £203 2s 8d., the balance standing to the credit of Profit and Loss from last year, leaves a credit balance of £29 16s 2d. to be carried forward. The Directors very much regret the poor result of the year's working due entirely to the low prices ruling for the class of tea which the Company's Estates produce. The total crop amounted to 269,104 lb., realising a net average of 5·23d., against 234,817 lb. realising a net average of 6·29d., last year. The Estates of the Company are reported to be in thoroughly good order. A few further improvements to machinery and factory have been made, and charged to current expenditure during the past year. The Directors have been impressed by the necessity of largely increasing the output of the Estates by higher cultivation, and have consulted the leading authority on manuring in Ceylon, Mr. Joseph Fraser, who has embodied his views in a voluminous

report which can be seen at the office of the Company. The Directors propose acting upon the advice given them, and trust that the result will be to the advantage of the shareholders. The Directors did not draw their fees for the latter half of the year and propose waiving them. Mr. B F White retires in accordance with the Articles of Association, and, being eligible, offers h mself for re-election. The auditor Mr. J D Stewart Bogle, C. A., retires and offers himself for re-election.

THE SOUTH TRAVANCORE TEA COMPANY, LIMITED.

DIRECTORS' REPORT,

to be submitted at the fourth annual ordinary general meeting. to be held on Tuesday, October 30th.

The directors beg to submit herewith their fourth annual report and balance sheet for the year ending 30th June, 1900. The outturn of tea was 311,709 lb. being 38,291 lb., below the original estimate, against 337,961 lb., last year. This shortage was entirely due to an extremely severe and abnormal drought during a portion of the year, which adversely affected the flushes. The average price realised was 5·38d. per lb., as against 6·03d. last year and 5·55d. the year before. The gross profit was £2,158 13s 11d., against £3,339 15s 10d., last year and £1,304 15s 3d., the year before. After providing £250 for the Debenture Sinking Fund and placing £300 to coast advance reserve, the nett profit amounts to £853 19s. which, with a balance of £467 16s 2d. carried forward from last year, leaves a sum of £1,321 15s 2d. which the Directors propose to dispose of as follows:—Preference dividend for the year £825. (This has already been paid). Leaving a balance to be carried fsrward of £496 15s 2d. In view of the present depressed state of the tea market, and of the falling off in the yield and prices during the past season, the Directors do not propose to distribute any dividend on the ordinary shares, but recommend that the balance of £496 15s 2d. be carried forward to the new year. The area under tea now amounts to 730 acres. The reports on the condition of the Company's properties from the Manager and the Visiting Agent are of a satisfactory nature. Mr. Stewart and Mr. MacDonald continue to give the Directors satisfaction in the exercise of their duties, and the falling off in the profits is in no way their fault. The Manager's estimate for the present season is 340,000 lb. In accordance with the Articles of Association, Mr. T C Owen retires by rotation, and, being qualified, offers himself for re-election. The Auditors, Messrs. Jackson, Taylor, Abernethy & Co., retire, and. being eligible, offer themselves for re-election.

THE CAROLINA TEA COMPANY OF CEYLON, LTD.

REPORT

of the Directors to be submitted at the eighth annual general meeting of shareholders, to be held at the offices of the agents, Messrs. Frith, Sands & Co., Winchester House, Old Broad Street, E.C., on the 31st October, 1900.

Your Directors beg to submit the balance sheet and profit and loss account for the year ending 30th June, 1900. The nett profit is £6,926 8s 4d ; amount brought forward from last year at credit of the ordinary shares £1,199 9s 9d = £8,125 18s 1d. From which has to be deducted debenture interest £2,450, leaving an available balance of £5,675 18s 1d which it is proposed to appropriate as follows:—To reserve fund £1,200; to new clearings, buildings and machinery £1,000; to a dividend on the ordinary shares of 6 per cent. (of which 2½ per cent. was paid on 26th April, 1900) £3,000 = £5,200; and to carry forward to the credit of the ordinary shares £475 18s 1d.

The crops secured during the season compare as follows with those for season 1898 1899:—Tea from estates 1899-1900, 1,131,333 lb.; 1898-1899, 961,757 lb. Cocoa from estates 1899-1900, 414 cwt. 1898-1899 555 cwt. The tea crop cost 4·78d. free on board Colombo, as against 4·61 per lb., in 1898-1899, the increase being due to the higher average rate of exchange of 1s 4 15-32d., as against 1s 4 9-32d. The average gross sale price was 7.06d., as against 7·65d. for the previous season. This fall being about on a par with the decline established in Ceylon teas generally, and alone more than accounts for the diminished profit shown by the returns. The yield of cocoa would have been larger had the Udapolla estate not suffered from severe drought during the blossoming season. The excess in the total expenditure on crop account over that for the previous season, was caused by the increased crop of tea, and by the inclusion of a sum of R4,653·80, equivalent to £319 6s 9d. for new clearings and upkeep, the cost of which in previous seasons had been placed to capital account. Including the sum of £1,200 to be added this year, the Reserve Fund now amounts to £9,600, besides which £1,000 is being placed to the credit of expenditure on new buildings, machinery, &c., to cover recent outlays on the Carolina factory, as referred to in the last report. Your Directors are pleased to state that in a special report on the company's estates, which was made by Mr. Megginson, the late estates Manager, during his visit to Ceylon this year, he confirms the advices previously before them that the properties are in a thoroughly satisfactory condition; that the extensions to the tea area, on which much capital has been expended since the Company's formation, have proved most successful and are giving a full return on the outlay; and that the estates are being worked on the most economic lines, consistent with efficiency and a due regard to their future. The staff in the Company's employ continues to give entire satisfaction. Your Directors have appointed Mr. Wharram Megginson to a seat on the Board, rendered vacant by the retirement of the late General Hopkinson, C.S.I., so that they might avail themselves of his intimate knowledge of the estates and their working. The Directors retiring by rotation are Mr. H St. J Oscar Thompson and Mr. C A W Cameron, who, being eligible, offer themselves for re-election.

PROGRESS AND PLANTING IN NYSSALAND, B. C. AFRICA.

(By an ex-Ceylon Planter.)

MLANJI, B. C. AFRICA, Oct. 1st, 1900.

I had a run into Blantyre to see the annual

AGRI-HORTICULTURAL SHOW

which took place on the 5th and 6th ultimo. My daughter and I left here at 7 a. m. and reached Blantyre, 40 miles, at 6 p. m., journeying in a machella, hammock slung on a bamboo pole with eight carriers each. What physique these niggers have to carry my weight, 13 stone, two men at a time, one at each end of the pole, changing from one shoulder to the other and relieving each other by turns as they get tired, trotting along like a pair of Pegu ponies—coolies could not do it. Four men to a chair with a lady in it pumps the Tamil in no time. The Show was not up to much. The people in this country do not seem to realise the amount of good such an exhibition does, and people say: "Oh! what have I got to exhibit, so and so has better than me; it's no use my trying, I'll get no prize, &c." Of course if everybody was to say and think the same, there would be no exhibitors at all.

We took in 20 exhibits and got 14 1st prizes, the principal ones being for coffee, ginger, turmeric, tea, fibre, butter, jams, cheese. The

number of European visitors to the Show would be about 250 including ladies, whose bright and cheerful countenances and handsome dresses added charm to the scene.

SIX CEYLON MEN

sat down to lunch, the day of the sports, at one table—Anderson, Moggridge, Robins, Power, Gay and myself. There was only one absentee, Lloyd, who by the way turned up to the Concert on Saturday evening. I counted over 200 Europeans on the sports' ground and every one looking the picture of health, including two Doctors. One of the latter I asked if there was anybody in Hospital? "No," was the reply, in rather a sharp tone!!—as if his professional services were not much required. He remarked, however, that the country appeared to be becoming more healthy. Notwithstanding the critics who assert that we are dying off like flies, and gambling with life, living in such a climate, we can live and do live well enough and enjoy life and work too. It was said, not long ago, that children could not live here. Why? I saw

FAT BABIES

in Blantyre (by the way Mrs. Hardy's, a Mlanji one, was the fattest, but I must not say the prettiest or I may get hauled over the coals by the parents of others) which would take a prize at any English Baby Show. What do you think? There are also to be seen fat rosy-cheeked youngsters with big pith-hats on, the very pictures of health, playing about in the open in the sun all day; surely with ladies and children galore, the climate cannot be so deadly as people would make out.

Ceylon seems to be overstocked with

CREEPERS OR GRUBBERS

at present. Why not send some of them over here; there is room enough in all conscience. Land and living is cheap, but I suppose they funk the climate, although they do not mind the glory of fighting the Boers. By the way I have a son who has been all through the war, and has not got wounded even, lucky boy: it is really marvellous how some escape.

COFFEE

is not looking over bright about Blantyre, There has been no rain for months, and the outlook is not promising by any means for the coming crop. We in Mlanji had 3½ inches of rain last month, which brought out a good blossom and set it well. This is a better tea than coffee country, the climate is so uncertain; but one likes to stick to coffee as it is not such a tedious cultivation as tea.

We have one great advantage here having a Sanatarium at our very door. In five hours or so I can get up to 6,000 or 7,000ft. elevation—perfection of a climate, but too cold and frosty when the sun goes north—May to August; but it is cold and bracing enough down here then.

I tried to kraal some

ZEBRAS

last month, but the men I sent to build the stockade built the gate on the wrong side, and the noise made in the changing of it drove the herd away. I am going to try again soon.

I bought a horse out of a batch of about 20 and it died from fly-bite within a week after I got it here, and the other horses all died, too, having been bitten on the journey here. H. B.

VARIETY OF PRODUCTS IN MEDIUM PLANTING DISTRICTS.

In mentioning the sale of Alpittikande in July last, we referred to the variety of products cultivated on this old favourite property, namely tea, cacao, coconuts (growing remarkably well) and arecanuts; but in addition there are over 40 acres of cinnamon fit for peeling and 10 acres under paddy, in splendid condition; while among minor products, there are pepper, erythroxylon, coca, camphor trees (prospering well), rubber and vanilla. Ten different products on the one property must be an unusual sight. Can this list be beaten anywhere else on a hill or low country estate?

SUGAR-PLANTING IN THE STRAITS SETTLEMENTS.

DRAWBACKS AND DIFFICULTIES AS WELL AS PROGRESS.

From an interesting letter from the Chief Manager of the large Sugar undertakings in the Malayan Peninsula to which frequent attention has been drawn in these columns, we learn that the present undertakings there have not been such plain-sailing as was anticipated:—"On one estate, Geelong, I am glad to say that after fighting sickness amongst the coolies and staff, we have at last got over the troubles incidental to opening up new land. A fine new factory has been erected and starts working this week on an excellent crop of canes extending over more than 1,000 acres, which area should be quadrupled in two years. At another estate, Rubana, on the Perak River, misfortune has overtaken us in the shape of crowded hospitals from ordinary ailments, but latterly cholera which we have only just managed to stamp out. Then to crown all, the rats came swooping down on us and ate down the whole of the canes—some 500 acres—which throws the estate back nearly a year. It has been most disheartening; in fact a long night-mare to me, but I now begin to see daylight through it all."

RUBBER FROM LEAVES.

Dr. Axel Preyer treats in the German *Tropenpflanzer* of the practicability of extracting rubber from the leaves of rubber-bearing trees. He describes certain quantitative experiments made with the leaves of the *Hevea brasiliensis*. In the first experiment the tree was aged 22 years; 500 leaves were treated; the latex was expressed from the leaves by manual pressure and coagulated with citric acid. Result 0·325 gramme (about 5 grains) of utilisable caoutchouc. In the second the plant was aged 18 months, same number of leaves and same process. Result 0·27 gramme (about 4 grains) utilisable caoutchouc. Dr. Preyer makes the following calculation with regard to cultivation on a commercial scale. *Hevea* plants of 18 months require but 10 centimetres (4 inches) of space between them; each plant carries 40 to 60 leaves, on an average 50, which answers to ·027 gramme caoutchouc: there would then be in a hectare (2½ acres) 1,000,000 plants giving 27 kilogrammes (59½ lb. avoirdupois) of caotchouc, even admitting that the yield could be doubled by mechanical extraction, which is doubtful. Dr. Preyer considers that it would remain too insignificant for remunerative culture.—*Indian Gardening and Planting*, Nov. 1.

THE NILGIRI GAME ASSOCIATION.

ANOTHER CONSIGNMENT OF TROUT OVA.

(*From a Correspondent.*)

Ootacamund, Nov. 4.—A meeting, after a lapse of fully six months, was held in the District Collector's office on Friday. Besides the President, Mr. C J Weir, as Collector of the District, and Mr. G Hadfield, Deputy Conservator of Forests, who has undertaken the duties of Honorary Secretary of the Association, there were present Sir Frederick Price, Captain Beadnell, Messrs. Pascoe and Herbert Brown.

A letter was submitted from Messrs. Andrews and Andrews, of the Surrey Trout Farm, expressing their regret at the failure of the two last consignments of trout ova, and offering to present the Association with 10,000 ova free of cost, provided the Association would pay the necessary packing and shipping charges, and suggesting that the consignment of ova be placed in charge of any of the members of the Association, who happened to be travelling back to India. The Honorary Secretary circulated a note with the above letter to the following effect :—" After the sad experience of the last two consignments, it is inadvisable to send for any more ova. Mr. Douglas may be asked if he could arrange with anybody in England to see to the careful packing of ova to ensure the safe arrival at Madras." It was resolved to thank Messrs. Andrews and Andrews for their liberal offer, and say that the Association would communicate with them later on. The Honorary Secretary was asked to place himself in communication with Mr. Douglas in this connection.—*Madras Mail*, Nov. 7.

TWO RUBBER-YIELDING TREES COMPARED.

Dr. Axel Preyer in the German *Tropenpflanzer* makes a comparison between *Ficus elastica Castilloa elastica* grown for rubber side by side near Subang in Java. The plantation visited by Dr. Preyer consists of 40 hectares (100 acres) of *Ficus* dating from 1864, but exploited since 1881. On an average of seven years this plantation aged 35 years gives a mean yield of 600 grammes of solid rubber per tree per year. The yield from year to year however varies enormously. In 1899 the total production of the plantation was 3,060 kilogs.; in 1895 about 3,520 kilogs.; in 1896 about 1,670 kilogs.; 1897 about 3,270 kilogs. A kilogramme equals 2 1-5lb. avoirdupois. At the same time there are astonishing variations between the trees themselves ; from 100 grammes to 12 kilogs. The latter phenomenal yield was obtained one year, without apparent reason from a tree tapped exactly in the same manner as the others. For some years past *Castilloa* has been put down, especially on the path borders, in the cultivation of Liberian coffee. Judging from the short experience of the plantation, says Dr. Preyer, the mean production of *Castilloa* aged 8 years would be 200 grammes of solid rubber per tree per year ; at the same time there has appeared the exceptional yield of 2 kilogs. As there are 400 *Castilloa* trees to the hectare and only 125 *Ficus*, the yield for the former at 200 grammes equals 80 kilogs. to the hectare and for the second at 600 grammes only 75 kilogs. ; therefore even at present despite the difference of age there is an advantage of 5kilogs. in favour of *Castilloa*. The rubber from the latter also fetches a higher price. In 1899 it was sold at Amsterdam at 5·20 florins per kilog. against 5 florins for *Ficus* rubber. Dr. Preyer however is of opinion that a plantation devoted to rubber on a large scale with European supervision would not prove remunerative even at present prices. Rubber seems to him to be an enterprise specially suited to be pursued as an accessory in other cultivations where the general expenses are already provided for otherwise.—*Indian Gardening and Planting*, Nov. 1.

THE EXPLOITATION OF RUBBER RESOURCES.

A PANAMA RUBBER PLANTATION.—The rubber plantations of the Las Cascadas Plantation Co., Limited, which are situated at Las Cascadas, in the district of Emperador, department of Panama, republic of Panama. This plantation has been in existence since January, 1890, when the then proprietors planted 40,000 India-rubber cuttings, none of which has yet been tapped, and they have been adding to these year by year. They also have a large quantity of coffee and cacao trees, the majority of which are now bearing.

DEVELOPMENT IN BOLIVIA.—The wealth of the rubber resources of Bolivia has been demonstrated fully, but they remain closed to the world in large part because (1) of the sparse population and (2) lack of capital in that republic, but still more so because (3) of the lack of convenient means of transportation. The only means of transportation supplied by nature is the outlet through the river Madeira into the Amazon, and this is rendered almost impassable by numerous cataracts. From a Bolivian source comes news of a French undertaking to build a railway connecting the headwaters of the river Acre with those of the Madre de Dios, the advantage of which will be that the whole navigable river system of Bolivia can then be connected to the Acre, which discharges into the Purus, and that into the Amazon —thus giving Bolivia access to the Atlantic seaboard without reference to the Madeira. The Acre district now exports about 2,000 tons of rubber yearly. It is estimated that the opening of the region which the proposed railway would make possible would soon increase this amount to 20,000 tons yearly.

CONCESSIONS FOR GATHERING RUBBER.—The government of Venezuela has granted to Senor Juan Dall 'Orso, of Maracaibo, a concession for exploiting India-rubber and other products on 15 square leagues of government lands in the district of Colón, state of Maracaibo, for a period of fifty years. He agrees to pay 40 bolivars (=$7·72) for each 100 kilograms (=220 pounds) of Rubber exported ; also, to distribute seeds of the Pará rubber trees among the planters of that district. A concession covering 18,662 acres has been granted to Senor Alejandro Ortega Martinez, in the same state, on the same terms. Maximillian Doremberg has obtained a concession for the exploitation of India-rubber, Chicle, and timber in the department of Palenque, state of Chiapas, Mexico, obligating himself to pay to the government $24 (silver) per ton of Rubber and $18 per ton of Chicle exported.

EXPORT DUTIES ON RUBBER IN PERU.—A decree of the Peruvian government dated May 23rd provides that for rubber lands for which concessions are granted by the minister of public works, a rental shall be paid of 2 *sols* per *quintal*, or practically $1 per 100 pounds, for all rubber extracted. In addition, an export duty is imposed of 5 cents per kilogram on Caucho and 1 cent (?) fine or Jebe rubber, there being 100 cents in the *sol*, worth 43·6 cents, gold.

Mexican Notes.—The Tabasco Commercial Co., with headquarters at Springfield, Massachusetts, are developing a tract of 15,000 acres in the state of Vera Cruz, Mexico, between Coatzacoalcos and Frontera, cutting mahogany and preparing to plant rubber and other crops.—*India Rubber World*, Oct. 1.

CEARA RUBBER.

has not always been considered of the highest value by the Ceylon planter. But from a report I have been reading, styled "The Diplomatic and Consular Report of Bahia" for July 1899, there is a good deal more to be said for it, apparently, than what used to be, at all events, thought in Ceylon. The present day planter, of course, may, for aught I know, be more fully alive to the virtues of "Ceara" than his predecessor. The writer of the aforesaid report begins the subject by a description of Para rubber, which, though aware of its high place commercially, he rather deprecates planters cultivating, on account of the unhealthy districts in which it flourishes. He suggests as alternatives the "Mangabera," and "Manicoba" varieties, but as the former requires from eight to ten years growth before yielding, I pass it over. Coming to

THE 'MANICOBA" TREE.

he says:—"Considering everything the 'Manicoba' plant shows many advantages over other varieties. It is easily planted from seeds or saplings, grows in six or eight months in any kind of soil to a height of six feet, and will begin yielding in about three years a considerable quantity of milk, far more in proportion than any other rubber tree in existence." He then cites the case of a planter known to him who has recently planted over 100,000 "Manicoba trees" and intends increasing the number to a million, being fully convinced that a very few years will show extraordinary results.

But what has all this to do with "Ceara," some person may ask? Simply this, that in another pamphlet by Mr. Thistleton Dyer, he says that he has identified the fruitful "Manicoba" tree with the "Ceara" plant. A retired Ceylon planter, with whom I was discussing the subject, tells me he had many Ceara trees on his estate, and never once troubled to tap them; he thought so little of them. If there are any planters still who are of the same way of thinking, the extracts quoted above may perhaps lead him to reconsider the question.—*London Cor.*

A FARMER'S EVERY-DAY LIFE.

No. 14.

(*By Cosmopolite.*)

HARVESTING AND SHEEP SALES.

The month of September has been,—as usual with agriculturists,—a very busy month, harvesting having been in full swing, in addition to all the big sheep sales of store lambs, so that those who deal as much in sheep as I do, have been kept pretty well on the trot. The moon, which has just run its course, came in on a Saturday, and full moon fell on a Sunday, reminding one of the old prophecy:—

"A new moon on Saturday,
On Sunday at its prime;
If it comes again in seven years,
'T will come in plenty time."

It was during the course of a moon, with these characteristics, that

THE TAY BRIDGE

was blown down and believers took every opportunity of drawing the public attention to the result, as being in keeping with prophecy. This month that has just passed over to the majority, however, has not kept up its character, for it has been windless and rainless, but with heavy fogs at night and sunshines during the day, so that another of the cherished beliefs of our youth has gone by the board. Cutting has almost been completed, and in some cases, farmers with the earlier and higher crops have begun leading the grain to the stack yards, with the usual result that much of it is heating and spoiling, so that extra work has been caused by turning the stacks, to let them cool.

PREMATURE "LEADING."

The so called practical farmer is very fond of leading his crop before it has had time to be killed in the stock, and no number of lessons seem enough to teach him wisdom. Yet he continues, year after year, to abuse the grain merchant for giving him a shilling or two less, per quarter, for his grain which has been discoloured, than what his more patient neighbour gets, who has allowed his crop to remain in the stook until it was ready for leading I fear that too much grain has been led before it was ready, this year, for I already hear the whirr of thrashing machines all around me, and excited farmers, whose stacks are heating, may be seen chasing the proprietors of travelling thrashing mills, and begging of them to come and thrash out their grain before it is quite useless. The outcome of this ridiculous haste is that grain will be knocked down in price, as the merchants will only consent to take grain that is soft and discoloured at a very low rate, and unfortunately, this brings the price of a good sample down also. I was speaking on the subject to the doyen of the grain trade in this locality, and he darkly hinted at prices going steadily downwards, and all because the so-called, practical farmer will persist in leading his grain before it is ready to be stacked. The grain merchant I refer to was, in the early fifties, a digger on Bendigo, at the same time as Lord Salisbury, and referring to that circumstance, it appears that Lord Robert Cecil was considered one of the strongest men and best miners on the gold field. I have no doubt his early experience as a digger has been of service to him in his after-life as a politician and premier of Britain.

THE WEATHER

of the past month has been more delightful than any we have had this year, although, personally, I have had no complaint to find with the drippy weather of the past summer as it exactly suited my land. and I find that I have a finer crop than ny I have had during my term here,

and my men, who have been with me all the time, have formed the same opinion. I heard a story about a farmer, in this neighbourhood, who pins his faith on

ARTIFICIAL MANURES AND THE "FIVE COURSE SHIFT,"

and who has had the usual result, namely, a poor crop. He was speaking to a neighbour of mine, and proudly boasted that he had finished his harvesting in three weeks' time, and had his crop all safe under "thack and rope." My neighbour drily replied: "I dinna care for they shortsome haresties, I like ain that taks a hantle o' wark and a lang time aboot it"; and these are my sentiments. When a man finishes his harvesting in a very short time, it is not a sign that he is a specially smart worker, but is generally proof of his being a mighty bad farmer and the grower of poor crops. I intended sending, this time, some peculiarly bright thoughts which occurred to me, in connection with the harvesting of the crop, but found, after putting these into elegant language, that some Shakespeare or Longfellow or Carlyle had anticipated me, and not unfrequently used my very words. If those fellows had never been, it had been millions in my pocket.

INSURANCE.

Insurance of buildings is not the only outlay in that direction that farmers have to meet, for most of them insure everything about the place, not forgetting their stock and even their labourers, the latter being a very necessary item, in these days of a master's liability. I have had my men insured for many years, but only twice have I put forward any claim against the company, both occasions being on account of sickness, for which I received 12s 6d per week during the time the sick man was off work. In the event of accident by which a labourer is permanently injured or killed, the Company stands between the insured and the claimant. Life insurance in Ceylon was a subject receiving considerable attention lately and clear proof was produced that risks were less in your island than in this country; but I lately read an article which proved that Ceylon was not the safest place in the world to live in, but the fields of our up-to-date battles. Cæsar, it was pointed out, thought very little of a fight in which 50 per cent of the participants were not killed out-right. In Napoleon's time the killed in battle averaged 25 per cent, in the American Civil War 20 per cent, and in our own little South African debate, it has been only 7 per cent. "At this rate," the article continues "in a few years more, the only really safe place for a timid man, will be in a big battle, and the insurance rates on the lives of military gentlemen in active service will be lower than the rates on tract distributors or hotel porters."

SUGARLESS TEA AND UNSALTED MUTTON.

Referring to the war in South Africa reminds me that I read in the *Observer* a letter from one who had been in the hands of De Wet as a prisoner. One sentence ran thus:—"For the first four days of our captivity we lived on nothing but meat, and I can tell you we got as weak as rats."* Now this fact I can corroborate, for, when I was a youngster, living, along with a companion, in the *terra incognita* of New Zealand, we ran short of everything in the shape of food, except tea and mutton; we had no flour, sugar, salt, &c., and, for four weeks, we existed on unsalted mutton and sugarless tea, and so weak did we become that we could scarcely walk a hundred yards, and we both became permanent believers in the old saying that "bread is the staff of life." When the boat, which was wont to bring provisions to us, ultimately did arrive, my comrade seemed unable to justify his appetite, and, after watching the truly magnificent way that he gorged himself, I asked if he was enjoying himself. "Yes, thank you," he replied, but what I don't like is the long time that is wasted between the meals!"

THE SWALLOWS

left us, this year, on the 28th of September, the same date as they have chosen for their departure, 17 times out of the past 19 years. How they know when the day comes round is one of those things that no fellow can understand.

PLANTS AND THEIR TREATMENT IN AMERICA.

We have to acknowledge with thanks receipt of the following from the Agricultural Department at Washington:—

Progress in the treatment of Plant Diseases in the United States, by B T Galloway, Chief of Division of Vegetable Physiology and Pathology.

Progress of Commercial Growing of Plants Under Glass, by B T Galloway, Chief of Division of Vegetable Physiology and Pathology.

Progress of Plant Breeding in the United States, by Herbert J Webber and Ernst A Bessey, Division of Vegetable Physiology and Pathology.

Two Diseases of Red Cedar, caused by Polyporus Juniperinus N Sp and Polyporus Carneus Nees. A Preliminary Report by Hermann von Schrenk, Instructor in Botany, Henry Shaw School of Botany, Special Agent, Division of Vegetable Physiology and Pathology.

COFFEE IMPORT DUTIES IN FRANCE

Havre, Oct. 15.—According to information obtained here, it is not correct, as reported from Bombay, that Indian coffee exported to France will in future have to pay double the duty levied upon Brazilian coffee. Coffee grown in British possessions will, on the contrary, continue to enjoy the benefit of the French minimum tariff indefinitely. Venezuelan coffee is the only coffee affected, as France has no commercial treaty with Venezuela, and the duty on coffee from that country will therefore be double what it is on other kinds. The duty fixed on Venezuelan coffee was at first to be applied to all coffee coming from Venezuela after September 21; but since this decision was taken, and in consideration of the protests made by the different Chambers of Commerce, this date has been extended until December 31. Meanwhile, a treaty is likely to be concluded with Venezuela, and then the import duty on coffee will be the same for all.—*Home and Colonial Mail*, Oct. 19.

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* Because there was precious little *of that meat* if we remember aright, in this case.—Ed. *T.A.*

THE TUTICORIN PEARL FISHERY.

The preliminary arrangements for holding the pearl fishery off the coast of Tuticorin were made by Captain Baker, the Superintendent of Pearl Fisheries, Tuticorin; but as he was suddenly taken ill, Captain James the Port Officer, Negapatam, was deputed to carry out the work. The fishery commenced on the 12th March last and lasted until the 28th idem, when it had to be closed as the divers were unwilling to continue the fishery owing chiefly to the immature condition of the oysters and the low prices realised by their sale. Though the revenue derived by Government during the fishery was more than sufficient to cover the expenses of working, the net profit (R11,033) says the Madras Board of Revenue, fell much below the estimated income (R93,000) and the fishery cannot be said to have been on the whole a success. It proved disastrous to the poorer folk—the boatmen and the divers who are reported to have realised hardly enough money to provide daily food for themselves and their families. It began badly by a combination among the merchants to keep down prices and when it became an undeniable fact that the oysters were immature and had a very few pearls, a panic set in so that for days together there were no sales of the Government share of the oysters, and the boatmen and divers had to sell their shares for what they could get. Captain James attributes these results to the commencement of the fishery, a year too early. He estimates that the oysters were only four years old and that they were too young to be fished. A sample of 5,000 oysters was opened by him during the fishery and the pearls extracted from them were valued by a dealer at R17-4-6 only, that is at the rate of R3-7-3 per thousand. The valuation reported by Mr. Baker in respect of the sample of 8,500 oysters lifted in October last was R10-2 per thousand, but, whatever the reason, the event has proved that that estimate was considerably over the mark. Having regard to the fact that valuation by experts is the chief practical guide for deciding whether or not a fishery should be held in a particular year, the Board considers that the method of estimation and appraising the pearls should be placed on a sounder footing.

The question of the possibility of a further fishery next year is not dealt with either by Captain James or the Collector. As a large stock of oysters appears to have been left on the bank, the Board considers that a sample should be lifted early in October or November next and a Report submitted on their condition in view to decide whether there are any prospects of a more successful fishery in 1901. It appears that some of the boatmen and divers of Tuticorin were at feud with the Jadi Talaivan and that their obstructive attitude contributed partly to the poor results of the last fishery. Mr. Bedford, the Collector, suggests that a system of rewards and punishments would be of use in dealing with a temporary panic such as that which took place on the present occasion, by enabling Government to exercise more control over the divers and boatmen. He proposes to consider the question at the time of holding the next fishery and his views will be awaited. The Board regrets to have to record the death of Captain James, who took much interest in and did much hard work in connection with the recent fishery. Mr. Bedford considers that the strain and worry incidental to the task must have told greatly on his constitution. The Government has approved the Board's proposals and shares its regret at the death of Captain James.—*Madras Mail*, Nov. 2.

PLANTING NOTES.

Castilloa Rubber.—We direct attention to the letter with which Major Wyllie has favored us. Perhaps Mr. Willis may be able to settle the question raised as to the varieties of "Castilloa" rubber now in Ceylon.

Tea for Caffeine.—In his report for 1899, the principal chemist of the Government Laboratory at Bombay states that 226 samples of tea, representing 3,322 packages, were found to be mixed with sand and others substances, and were refused admission for home consumption. Tea which cannot be passed for use as a beverage is mixed in bond, with assafœtida and lime, and used for manufacturing caffeine.—*Chemist and Druggist*, Oct. 27.

Dutch East Indies.—Tea Trade.—The *Moniteur Officiel du Commerce* points out that the fall in the prices of coffee in the consuming markets has caused increased activity in tea cultivation in Java. Within the space of nine years the exportation of Java tea to Amsterdam only has more than trebled: in 1891 it was 20,639 cases (a case generally containing 40 kilos.), and in 1899 it was 69,320 cases. At Amsterdam the prices of tea in 1899 showed the following fluctuations:—

	Highest price. Florins.	Lowest price. Florins.
Flowery Pekoe ...	1.52	0.38
Orange Pekoe ...	0.60	0.30
Broken Orange Pekoe	0.51	0.38
Pekoe Souchong ...	0.41	0.25
Souchong ...	0.38	0.29

A Fruit Paradise is Southern Arabia or Felix Yemen, as described by Mr. Zwemer in a book just published. We quote from a review in the *Spectator*:—

"The day after leaving Mabek brought us to the beginning of the happy valleys of Yemen, very different from the torrid coast. A country where the orange, lemon, quince, grape, mango, plum, apricot, peach, apple, pomegranate, fig, date, plaintain and mulberry, each yield their fruit in season; where wheat, barley, maize, millet and coffee are staple products, and where there is a glorious profusion of wild flowers—called 'grass' by the unpoetic camel-drivers. A land whose mountains lift up their heads over 9,000 feet, terraced from chilly top to warm valley with agricultural amphitheatres, irrigated by a thousand rills and rivulets, some of them perennial, flowing along artificial channels, or leaping down the rocks in miniature falls. A land where the oriole bangs her nests on the dark acacia, the wild doves hide in clefts of the rock and the chameleon sports his colours by the wayside under the tall flowering cactus. Such is Yemen."

"The road from Ibb to Yerim has perhaps the finest scenery of any part of Yemen; never have I seen more picturesque mountains and valleys, green with verdure, and bright with blossoms,—scabiosa, bluebells, forget-me-not, golden rod, four-o'clocks and a large oleander trees. The cacti plants were in full bloom and measured twenty feet against the mountain passes. Two thousand feet below one could hear the sound of the water rushing along the wady bed.'

TO ALL PARTS OF ASIA, AFRICA, AMERICA AND OCEANIA.

Seeds & Plants of Commercial Products.

Castilloa Elastica Cervantes.—Orders being booked for the coming crop of seeds available in June and July, selected seed from very old trees. R. N. Lyne, Esq., Director of Agriculture, Zanzibar, writes under date 24th August, 1899:—"Please send me 200 seeds of Castilloa Elastica for further trial; the seeds of Castilloa you sent me last August germinated very well." Price and particulars in our Circular No. 32; special quotations for large orders according to quantity; immediate booking necessary to avoid disappointment.

Hevea Brasiliensis (Para Rubber).—Orders being booked for the coming crop available in August and September, 1900. This is the only crop of seeds in the year. All orders should reach us before the end of July to avoid disappointment, as we have to make arrangements in time; guaranteed to arrive in good order at destination. We have already booked a large number of orders. A leading Sumatra Planter, who ordered 50,000 Hevea Brasiliensis seeds last year writes under date 27th February, 1900:—"I received your favor of the 12th instant, out of which I learn that you booked me for 100,000 Hevea Brasiliensis seeds for August and September on the same conditions as before, but at the price of—— per thousand." Plants can be forwarded all the year round in Wardian cases. Price and particulars as per our Circular No. 30. A Borneo planter writes dating, Sandakan, 17th August, 1899:—"The last lot of Para seeds turned out very well.' Our shipments of Para plants last year has exceeded over 300,000 to different countries. Special terms for large orders on application.

Kickxia Africana (Lagos Rubber).—One of the staple articles of commerce in Lagos grow very vigorously, realizing over 3s. per lb. in the Liverpool market. Seeds and plants, price on application.

Hancornia Speciosa (Mangibeira Rubber).—Besides the value of rubber, it bears delicious fruits, which is a great favourite with the Brazilians, cultivated for both purposes. Seeds and plants, price on application.

Coffee Arabica Liberian Hybrid, Maragogopie Hybrid, C. Stanophylla and other varieties. Price of seeds on application.

Ficus Elastica (Assam and Java Rubber).—Seeds supplied with instructions; price according to quantity. This tree grows equally well in high and low land, in forest and grass land, its cultivation being extended largely by the Indian Government. For price of seeds with particulars as per our Circular No. 33.

Manihot Glaziovii (Ceara or Manicoba Rubber).—Fresh seeds available all the year round; price as per our Circular No. 31.

Urceola Esculenta (Burma Rubber) and **Landolphia Kirkii** (Mozambique Rubber).—Seeds and plants, both are creepers.

Cinchona Seeds.—Different varieties.

Sterculia Acuminata.—(Kolanut). Superior quality, seeds and plants; price on application, packed to stand the transit well for several months, a hardy tree, cultivation easy.

Erythrina Lithosperma.—Thornless variety, new crop of seeds ready in December, May and June. Price acccording to quantity on application.

Seeds and Plants of Cinnamon, Nutmeg, Clove, Sandlewood, Pepper, Cardamom, Vanilla, Cacao, Tea, Coca, Fibre, Medicinal and Fruit Trees, Shade and Timber Trees, Eucalyptus various varieties, also Palms, Bulbs, Orchids, &c.

Our onlarged Descriptive Price List of Tropical Seeds and Plants of Commercial Products for Foreign Countries for 1899-1900 are now being forwarded to applicants in different parts of the world. Also Descriptive Price Lists of Seeds and Plants of Fruit Trees, Bulbs, Tubers and Yams, and Orchids.

"South Africa."—The great authority on South African affairs of 25th March, 1899, says:—"An interesting Catalogue reaches us from the East. It is issued by William Brothers, Tropical Seed Merchants, of Henaratgoda, Ceylon, and schedules all the useful and beautiful plants which will thrive in tropical and semi-tropical regions. We fancy Messrs. Williams should do good business, for now that the great Powers have grabbed all the waste places of the earth, they must turn to and prove that they were worth the grabbling. We recommend the great Powers and Concessionaries under them to go to William Brothers."

Our new Descriptive Price Lists of Seeds of Shade Trees for Coffee, Cacao, Tea, Cardamoms, &c., Timber Trees, Trees for Avenues, Hedges, Wind and Shelter Belts, Ornamental Trees, Shrubs and Climbing Plants; and Seeds and Plants of Palms, Calamus, Pandanus, Cycads, Tree and other Ferns, Crotons and Dracinas, now being prepared and will be ready shortly.

Special Arrangements made with foreign Governments, Botanical and Agricultural Departments, Planters and others for supplying seeds and plants of Commercial Products in large quantities.

Agents in London:—Messrs. P. W. WOOLLEY & Co., 90, Lower Thames Street.

Agent in Colombo, Ceylon:—E. B. CREASY, Esq.

Telegraphic Address:
William, Veyangoda, Ceylon.
Lieber's, A.1. and A.B.C. Codes used.

J. P. WILLIAM & BROTHERS,
Tropical Seed Merchants,
Henaratgoda, Ceylon.

53

JAMAICA TO SUPPLY FRUIT TO ENGLAND.

Our columns have this week borne testimony ot the fact that a new era is dawning in the relations of the United Kingdom with one of our oldest colonies. From the beginning of next year a new line of steamers, built specially for the rapid conveyance of tropical fruit, will be established by the firm of Elder, Dempster, and Co. to run fortnightly between this conntry and Jamaica. The steamers are to be of large size and adequate speed, and will rnn direct from Bristol to Jamaica in about 12 days. They will carry mails and passengers, and the service will receive a subsidy of £40,000 a year, to be paid partly by the Imperial Government and partly by the Government of the colony. It is a condition of the contract that the owners of the line shonld purchase 20,000 bunches of bananas for conveyance by each ship, paying for them at the market price of the day. It will be seen at once that this is no ordinary development of maritime and commercial enterprise, though even from that point of view it is not without interest as reviving the old historic connexion between Bristol and the West Indies. It is really a great Imperial undertaking, warmly advocated by the late Royal Commission on the West Indies, and now warmly espoused by Mr. Chamberlain as a salient feature of Imperial policy. The cultivation of the banana promotes and develops many other valuable cnltivations, as was shown at length by our Special Correspondent whose letters on the West Indies we printed at the close of last year. It is thus no extravagent estimate that the value of the fruit exports from Jamaica may in a few years exceed the present value of all the exports from the island and may amount in the end to at least £2,000,000 a year. In 1896 the export of fruit from Jamaica amounted to over 4,000,000 bunches of bananas, to nearly 10,000,000 coconuts, and to nearly 100,000,000 oranges, not to mention other frnits, and it has since largely increased. In the height of the banana season it is no uncommon thing for eighteen steamers to leave Jamaica in a week for the ports of the United States, principally Baltimore, Philadelphia, New York, and Boston. As the supply is inexhaustible the same thing may some day come to pass in the ports of this country. In the meanwhile the establishment of the new direct service, even on its present footing, should offer to those who love the sea a very inviting temptation to visit one of the most beautiful islands in the world. The climate of Jamaica affords every variety of tropical temperatnre except those which are oppressive and relaxing; its scenery lacks no element of tropical majesty and tropical enchantment. Now that it is possible to reach the island in less than a fortnight, and to spend a month there without being absent more than eight weeks from home, snrely many a sea-loving Englishman, with imagination enough to appreciate the historic associations of the British Antilles and taste enough to enjoy the glories of tropical scenery at its best, will say with Kingsley "At Last" and seek the shores of an island which more than any other perhaps in the whole world typifies and illustrates the Imperial instincts and trinmphs of his race. Let us hope, too, that those who go will retnrn convinced that Froude was mistaken in thinking that the sons of the Empire are no longer worthy to bend the bow of Ulysses.—London *Times*, Oct. 13.

THE FOREST DEPARTMENT.

Western Province.—The plantation at the Model Farm at Kalutara has been weeded each month, the expenditure on upkeep being R393·63, or R14·58 per acre. The jak are reported to be doing well and beginning to seed, while the ingasaman and lunumidella are dying out. The Para rubber plantation at Midellena in the Pasdun korale had to be abandoned. The top soil was washed away by heavy rain, and elephant deer completed the destruction of the plants. The expenditure on this plantation up to the time when it was abandoned amounted to R128·47. There has been no expenditure on the other plantations, although I have requested the Assistant Conservator to remove the suppressed trees at Botale and Polonnaruwa.

Hill Reserves.—In the Nanuoya strip plantations the *Eucalyptus robusta* are doing fairly well and require some light thinnings, but the strips originally planted with *Eucalyptus Globulus* and *Acacia decurrens* are not a success. Luckily a large number of standards were left in these strips. At Conical Hill the strip plantations amounting to 38½ acres in compartment I., have made a considerable stride since last year. The very fine plantation at Haputale now requires thinning or coppicing in strips. The coppice made in 1896 is now almost as tall as the uncut strips of 1888-89. The coppice shoots are on an average over 12 inches in girth, whereas the uncoppiced poles planted in 1889 are only about 19 inches in girth. An additional area of 2 acres was coppiced and yielded 263 cubic yards of firewood, which were sold for R526. As the cost of coppicing 2,223 trees was R111·15 and of bringing the wood to depot was R118·60, the net surplus on the transaction was R296·25, or R148 per acre, which for a plantation ten years old is good. Windfalls in this plantation gave 142 cubic yards of wood and 290 small poles, which sold for R348·40, the cost of the work being R175·40.

In the nursery clearings at Nuwara Eliya the undergrowth of brambles, &c., was cut down. This plantation is doing well as is also the plantation of *Eucalyptus Globulus* behind the Kachcheri, which should be coppiced.

BREATHING TIME.

HOW TO CURE PULMONARY DISEASES.

If during the coming winter the observant pedestrian should notice innumerable excited people striding through the streets with a stick across their backs and between their elbows, he must not jump to the conclusion that London has suddenly lost its senses. For this form of exercise is part of a treatment which is now rapidly becoming popular—the cure for asthma, bronchitist and all the other pulmonary diseases which trouble and distress the dwellers in our foggy, smoke-laden cities. Hitherto the asthmatic person has kept indoors as often as possible, carefully shutting windows and doors, and keeping a roaring fire blazing in the grate. Now he is bidden to fling his windows open, to sleep even with his windows open, and, moreover, to keep in the open air as much as possible. But this is not all. He is taught that it is not so important what he breathes as how he breathes. Breathing-exercises, then, are part of the cure, and here not only the sufferer from bronchial catarrh is concerned, but even the woman of fashion anxious to maintain her good looks. For fifteen minutes twice a day women of fashion, asthmatic patients, and, indeed, all the world, are bidden to stand out of doors, preferably in the sunshine, and holding the chest up, to inhale slowly through the nose, and then as quickly exhale the breath through the month. Of course, everyone knows that it is through the nostrils he should inhale, and it is quite probable that many of humanity's ill nesses are due to improper breathing; but, at the same time, it will be an almost superhuman feat to make mankind breathe through the nostrils.—*Globe*, Oct. 19.

SUN-FLOWER CULTIVATION IN RUSSIA.

Our Consul-General at Odessa says in his last report that there is a growing demand in Russia for oil-yielding seeds, particularly for those of the sun flower. Until recently there were but few mills for expressing this oil, and the grocers finding no market sent their seed abroad. Now, however there are mills in Russia which require large quantities of it, and they offer the growers higher prices than those obtainable abroad. With the increasing home demand a decline in the exports of oil-seeds may be looked for in the near future. Samples of sun-flower seeds were asked for by the Government of Bengal, where it is intended to try them. The Consul-General from personal experience states that the plant will grow very luxuriantly in East Africa, and he suggests that it may be found a suitable crop for other British colonies. In Russia it is found that the best results in sunflower cultivation are obtained from a well-tilled soil, with not too much clay in its composition; it should be well-ploughed in the autumn and harrowed in the spring. The seed should be sown in April or May in every second or third furrow, One or sometimes two or three seeds should be put into the ground at a distance of two to four inches apart. Broadcast sowing may also be resorted to, care being taken that only one seed falls in every two square feet. The quantity of seed required per acre is twenty pounds; the yield, if good, should be about 1,600 pounds. The yield in oil of seed in husks is seventeen per cent; without husks, twenty per cent. The seed is much liked as a light refreshment by the poorer Russians, and is sold in the streets by hawkers, to be eaten as nuts are eaten in England.—London *Times*, Oct. 8.

DEVELOPMENT OF THE SOUDAN.

FORESTRY.

The Anglo-Soudanese Government has taken up the question of the development of the vast Soudanese forests, which may be a very possible source of future wealth, and an expert in forestry from Burmah has been appointed to study and report on the best methods of introducing improvements and utilising this potential source of wealth. Mr. C E Muriel, Deputy Conservator of Forests in Burmah, has, with the consent of the India Office, joined the Anglo-Soudanese Government for one year, the unexpired portion of his furlough. Mr. Muriel arrived in Cairo on Wednesday from England, and will shortly proceed to the Soudan.

Sir William Garstin, in his report on the Soudan, says:

"It is very much to be hoped that a scientific examination of the Soudan forests may ere long be carried out under the superintendence of an expert. An Indian forest officer (from Burmah for choice) might be deputed for this purpose. It is certain that much valuable information would be obtained from his report. Such an appointment needs no recommendation—its necessity is obvious. A trained forest officer could, moreover, render good service by advising the Government as to the best method of preserving the valuable fuel supply which at present exists on the banks of both rivers."

Although it is only a little over a twelvemonth since the report was published, the advice has been acted upon, and it is to be hoped that some serious attempt will be made to restrain the enormous waste of most valuable trees that now goes on. The supply, although apparently, inexhaustible, must speedily diminish, unless the cutting and felling of the areas is carried out upon some regular system which will permit of the young trees growing up and replacing those cut down. It is, of course, inevitable at present that the felling should be carried out in a wasteful manner. Fatigue parties are landed from the boats and are required to cut the largest amount of wood in the shortest possible time. The men have no idea of the value of the trees, and naturally select those which are nearest to the water and easiest cut. Should this practice be continued, it is certain that a few years must see a great diminution in the belt adjacent to the river. On the Blue Nile even the valuable gum-producing acacias are being felled for fuel.

The vast forests of the Soudan line the banks of the Upper Blue Nile and extend, in an easterly direction, to the Abyssinian frontier. In the Bahr-el-Ghazal Province also, particularly in the Bongo country, large forest tracts exist. The ebony tree (*Dalbergia Melanoxylon*) is met with south of Karkauj, on the Blue Nile, and again in the vicinity of the Sobat River. This tree does not, in these latitudes, attain to a very large girth, nine inches being apparently its maximum diameter. It must, however, be very common in these forests, as most of the principal houses in Omdurman are roofed with it. The value of the *Acacia Arabica*, from which the white and red gum is obtained, is well known; while the other kinds of acacia, such as *Acacia Nilotica* (in Arabic, "Sant"), is the chief source of the fuel supply. The bamboo is met with in the ranges of hills to the south of Famaka, and, according to some, the mahogany tree is found in the forests round Fazogl and in the Beni Shangul country. The means of transporting such woods can only be by the river. Unfortunately, neither the ebony nor the acacia will float in water, and, therefore, such transport is debarred in these cases. If a good and serviceable timber tree can be discovered in the Blue Nile forests which can be floated down the river to Egypt, a large source of revenue will undoubtedly have been found. Extensive saw-mills might be erected at Assouan, utilising the power available at the dam, now under construction, and an important timber trade might one day arise.

On the White Nile, in the Bongo and Rohl districts, the india-rubber creeper (*Landolphia Floribunda*) is found in great profusion. If the rubber yielded by this creeper be not of quite so good quality as that obtained from the india-rubber tree (*Ficus Elastica*), it is still of sufficient value to be counted as an important asset in the future trade of the Soudan. This plant, which has large laurel-shaped leaves, and a white flower resembling a jasmine, requires several years to mature before yielding rubber in any quantity. The natives obtain what they require by tapping the stem, usually in such a reckless manner that the creeper dies under the operation. The india-rubber tree should certainly flourish well in most parts of the Soudan, more particularly south of Khartoum. Although this tree takes from twenty to thirty years to arrive at a girth sufficient to permit of regular tapping, its yield is so valuable (about 3*l*. per tree per annum) that its introduction into the country is well worth attempting.

The above brief resumé fully shows the necessity of beginning a careful study of Soudanese forestry. It will be long before the Soudan will have a Woods and Forest Department organised on the Indian model, but the Anglo-Soudanese Government is to be congratulated on having secured the services of an expert, and we shall look forward to Mr. Muriel's report with great interest.

TOBACCO CULTIVATION IN THE SOUDAN.

A proclamation, signed by Lewa Jackson Pasha, as Acting Governor General of the Soudan, appears in the *Sudan Gazette* giving notice that the cultivation of tobacco is entirely prohibited North of Khartoum. South of Khartoum it is permitted

only with the consent of the Moudir. Such consent may be granted only in districts where tobacco was regularly grown in the time of the Dervishes.—*Egyptian Gazette*, Oct. 16.

A COLONY OF VEGETARIANS.

A colony of vegetarians are living on Tagula Island, a tiny bit of land, in the Dutch archipelago, about 700 miles south-east from New Guinea, and 1,000 miles north-east from Australia. Under the leadership of a Methodist clergyman, the Rev. James Newlin, of Ohio, some seventy people sailed from San Francisco in 1890 for Hawaii. They believed that a higher plane of Christianity was to be reached by a vegetarian diet and freedom from contamination with degenerate mankind. So they gave up their friends and homes in the Eastern States. Tagula Island was finally chosen for their colony. There were about fifty good-natured natives there who welcomed the new comers. There have since been accessions to the colony of people from England, Australia and America.—*New York Sun.*

IDENTIFICATION OF FIBRE.

While a great deal has been published on the identification of the different fibres in commercial use, much of this has not had a truly commercial aspect. It is frequently difficult to identify a fibre from the description given in commercial text-books, especially where fibres closely resembling each other are examined under a microscope after the ordinary treatment or mount.

A writer, in speaking of the microscopical identification of some useful fibres, says that the separation of the ultimate fibres by teasing is tedious, and often leads to a very unsatisfactory mount. The best way is to remove by chemical treatment the resins cementing the ultimate fibres into the filament. This is more difficult with some fibres than with others, those having a high content of silica being usually the most refractory. In this particular, sisal and manila are the most noteworthy.

In a commercial laboratory, where results should be obtained as quickly as possible, a quick temporary mount has to be made which will show the characteristics of the fibre necessary for identification; and in order to prepare the fibre for such a mount, a suitable chemical treatment not occupying too much time is a great desideratum. The best method consists in boiling the fibre in a 2 per cent solution of caustic alkali, washing and suspending the fibre in water, and passing a stream of chlorine gas through it until it is thoroughly bleached and the gums thoroughly destroyed. This may also be done by placing the specimen in a solution of chlorate of potash acidified by hydrochloric acid. At this stage the filament is entirely destroyed, but the ultimate fibre retains the form of the filament. The material is then rinsed in alcohol, and mounted in Canada balsam in the usual way. After this treatment there should be no difficulty in teasing out the ultimate fibre.

The fibre may then be examined under a microscope or micro-photographed. The best method for the examination of fibres is with artificial light, using a polariser. The joints or markings on the fibre seem to have a different rotatory power, or at least they are brought into a more distinctive effect in relation to the rest of the fibre. This is also true in photographing, and the best photographs have been obtained by using an arc light and polarising the rays. The markings are more distinctly brought out when the analyser and polariser are in such relative positions that the background or field is almost totally dark.

To distinguish between sisal and manila is one of the hardest problems of fibre identification, but little trouble has been found after treating the fibres in the manner described above. The characteristic appearance of manila is very much enhanced by the chlorine treatment, and the same is true of sisal. The sisal is very much coarser than manila, and tapers considerably more; when properly prepared the dark centre is seldom apparent. It has, however, after the treatment mentioned above, peculiar markings, having transversal cross-makings which appear to form X's upon the fibre. The peculiar formation of the cotton fibre is so distinctive as to need no comment. Wool, with its peculiar scaly appearance, is also very distinctive, and where wool and cotton are found together they are readily distinguished by an ordinary mount. The above treatment has never been tried on animal fibre, for the reason that nothing would be gained.

Silk is also distinctive; it is quite even, but occasionally little nodules are noticed in the side of the fibre, and for this reason it is not as regular in width as manila. It has apparently no markings, and its ultimate fibres are also its filament.

Among the textile fibres the most difficult to distinguish one from the other are flax and ramie. They are used in the same class of work, when ramie is used at all, and have the same general microscopical appearance. Ramie, at first sight, looks very like flax, although, upon a minute examination, a difference will be observed. The ultimate fibre of ramie is usually coarser, the bamboo-like joints are larger and more marked, and have quite a different appearance from that of flax as seen with a moderately high-power glass.—*Textile World*, Boston, Mass.

BANANAS.

Sir Walter Besant in his column in *The Queen* has the following:—

Bananas should become cheap; they stood for a long time at the figure of 2d apiece which is now preposterous. They became popular about twenty-five years ago, being then sold, as I said at 2d. They are now with many children almost as much an article of diet as potatoes, and I should say, more nutritious. There are several ways of eating them. The best is the simplest and the most obvious; the next best is the banana fritter, made just like an apple fritter; the third way is to "triturate" the fruit with a fork, to pour over it a tablespoonful of claret and to add a little sugar. It can then proclaim a rivalry with strawberries and cream, the more readily because the banana is generally taken when strawberries are not in season.

MOLLUSCS AND PEARLS.—There is no end to the number of ways in which pearls can be secured naturally or artificially. Here is one of the latest reports of the kind:—"A novel method of producing real pearls from ear-shells (*Haliotis*) has been tried with some success by Monsieur L Boutan, who has described his experiments to the Paris Academy of Sciences for 1898. The method practised is to drill a small hole in the shell of the living mollusc, at a considerable distance from the margin, and to introduce through this aperture one or more minute globules of mother-of-pearl; the mollusc being then returned to its native element. From their position, the introduced globules are prevented from escaping, and in due course are coated with nacreous deposit thus producing really fine-pearls."

CACAO CULTIVATION.

Mr. Carruther's Circular.

At a recent meeting of the Cacao Committee of the Ceylon Planters' Association, Mr. Carruthers spoke on the importation of new varieties of Cacao from foreign countries and stated that the Director, Royal Botanic Gardens, asked him to represent him at the present meeting He thought he might safely promise on behalf of the Director his co-operation and to undertake to get any small importation, *i.e.*, if any member could specify any particular seed.

Mr. Carruthers read questions (annexed) which he had circulated lately to cacao-growing countries in the West Indies with a view to Ceylon planters also answering them. Mr. Carruthers also indicated that if the Committee will decide what experiments should be undertaken, action would follow.

The Committee should accordingly draft a list of certain experiments desired by cacao planters.

Mr. Carruthers had drawn up a few notes which he read, both as to disease and as to means to combat or cure the disease; if practical men were satisfied that experiments had been successful; or if a cure had been effected in specific instances, what was the general effect. As regards native holdings badly diseased, influence should be used in such cases to get rid of dead trees on these native gardens in the neighbourhood of estates.

Resolved:—"That Mr. Carruthers and Mr. Huxley be asked to draft suggestions for experiments to be undertaken, and that they be circulated to the Cacao Committee as soon as possible, (II) that the Government Agents of the Central and North-Western and Uva Provinces be invited to use their influence with the Headmen in the cacao districts in the direction of getting proprietors of cacao estates and gardens to cut down and burn cankered trees with a view to preventing the spread of the disease which, if neglected, is likely to jeopardise the prosperity of the industry, both in European and native hands."

The Cacao Committee of the Planters' Association then adjourned.

QUESTIONS REFERRED TO WHICH MR. CARRUTHERS LATELY CIRCULATED TO CACAO-GROWING COUNTRIES IN THE WEST INDIES.

Is the mature Cacao shaded, and if so for what reasons, *i.e.*, from the sun or wind?

What shade trees are used and at what distance apart in each case?

Do you find the shading is beneficial to healthy Cacao? How does it affect the crop?

Does shading affect the attacks of insects such as Helopeltis, Thrips or any local insects?

What effect has the shade on diseases caused by fungi on stem, branches and fruit?

What distance apart do you plant the trees—are they planted at first thicker and afterwards thinned out?

Is any system of pruning carried out and if so what? Are suckers allowed to remain?

What proportion of fruit that is set, eventually reaches maturity? To what cases do you attribute the withering or drying up of pods in their initial stages?

What is the average number of ripe pods produced by a tree in full vigour?

To what age does the Cacao grow under favourable conditions?

What is the average annual percentage of deaths of trees and to what causes are they due?

How long do the individual leaves remain on the tree?

Do any varieties suffer less from parasitic or other diseases, if so which? Have you any reason for attributing their immunity to any special characteristic?—A Philip, Secretary, Planters' Association of Ceylon.

PLANTING NOTES.

Irrigation in India.—We learn from Simla, 27th October, through the *Pioneer*, that the Government of India in reviewing the irrigation reports for 1898-99 state that 21 productive works paid collectively 9·62 per cent on the capital outlay, the least remunerative being that of the Periyar project, which paid only 1·7 per cent. The total area irrigated by all classes of works was 18¼ million acres, the value of the crops raised being 39 1-7 crores of rupees.

South India and the Ceylon Tea Exports.—The Wynaad correspondent of the *Madras Mail*, writing upon the most recently revised estimate of the current year's tea exports from Ceylon, says:—"These figures are calculated to make the owners of tea property in this part of Southern India anxious as to the prospects of their growing tea industry, but it is to be hoped that when all the well opened gardens on the plateau arrive at maturity we shall be able to record average yields of 600 lb. per acre, while the cost of placing and selling the teas will not exceed 5¼d., and that as Indian teas have for many years past averaged higher prices than those from Ceylon, our new staple will hold its own successfully." Excellent confidence, but there is also the factor of "pushing foreign markets," in which campaigns we venture to think Ceylon is still some way ahead of India.

Assam Rubber for Westralia.—The Woods and Forests Department has received from the inspector-general of Forests, India, a supply of Assam rubber (Ficus elastica), a portion of which is being distributed to resident magistrates, wardens, etc., throughout the tropical portions of Western Australia, for experimental sowing, and with directions as to cultivation. The rubber grows equally well on high or low land, in forest or grass country, but preferably on a light sandy loam, and, provided it is shaded from the direct rays of the sun in the early stages of its growth, is easily raised from seed To give some idea of the value of this tree, it may be stated that the import of rubber into the United Kingdom amounted in 1884 to 198,000 cwt., representing a value of £2,266,000, and the demand has vastly increased during recent years. In Assam a tree of Ficus elastica is tapped when it attains about the age of 25 years. When 50 years old the yield is about 40 lb. of rubber every third year, and continues till the tree is over 100 years old. The white sap flowing from cuts in the trunk is poured into boiling water, stirred until it gets firm, and is then taken out, pressed, and finally washed with lime water.—*Perth Morning Herald*, October 11th.

Mysore and the Coffee Stealing Act.—The report on the working of the coffee stealing prevention act in the Mysore Province shows only seven cases during the year against 19 in the previous year. The diminution is due to the deterrent effect of exemplary punishments awarded.—*Times of India.*

The Peanut Oil Industry.—The American Consul at Marseilles reporting lately on the peanut oil industry observes that more oil is extracted in Marseilles from oleaginous seeds than in any other place in Europe and the industry is beginning to flourish again after the depression produced by the introduction of American cotton seed oil and the failure of the seed crops elsewhere. As no special machinery or process is employed in the manufacture of peanut oil as distinct from other oil seeds the manufacturers crush arachides, or peanuts when the market is favourable but not to the exclusion of other seeds. Last year over 71,000 tons of peanuts reached Marseilles: at Bordeaux a large quantity of West African nuts of good quality is crushed and there are some mills in the north of France, but Marseilles stands pre-eminent in the industry. The nuts are scarcely ever ground whole as this produces inferior oil and cake of little value. In fact a large quantity of the nuts arrives shelled after which the inner or red skin is removed as much as possible by processes resembling those for cleaning wheat in flour mills. These are described in detail in the report. After the kernels have been separated and cleaned they are ground and enveloped in strong fibrous mats, are subjected to hydraulic pressure, and the clarifying of the oil done by means of filters and fuller's earth. The husks are sometimes ground with the cake and form an inferior food for cattle and when coal is dear they are used as fuel in the oil mills. The crude oil runs out thick and troubled, and must be filtered to make it a bright yellow, while if it is to be water white in colour it must be treated further with animal black and fuller's earth. It is stated that no alkaline lye is used, but the art is somewhat secret. The source of supply are Bombay, Mozambique, and Senegal. In some years the African supply is wholly swamped by the supplies from India, and at one time it seemed that Africa would be unable to compete permanently with India. But though the latter still sends large quantities of nuts to Marseilles it appears to be using more and more of its crop at home, so that while the imports between 1890 and 1895 were mostly from India, in 1896 to 1899 they were mainly from Africa. In the earlier year of the decade American cotton oil menaced the crushing trade of Marseilles with extinction because of its low price, but apparently new demands for oils have arisen for the production in Marseilles has returned to its former average and prices also after serious derangements have resumed their old level. There has been a world-wide decrease in the amount of animal grease, while America is consuming her own cotton seed oils in vastly increased quantities and the consequence is an increased demand for vegetable oils. Although the production of the nuts in Africa is enormous no improvement in the mode of cultivation or the price is anticipated for years to come. The soil is readily exhausted by the crop and nothing is done to restore its virtue; labour, though cheap is thriftless and hard to obtain when wanted and transporation is defective. The uses of the oil are numerous; it is described as "the most polymorphous of all oils, adapting itself to all purposes, including nutrition, lighting, lubrication and blending." It is the most difficult of all oils to detect when adulterating olive oil for its chemical reaction is white. The best qualities are in fact used for the table, either pure or mixed with olive or sesame oil; as an illuminant it gives a soft white light; when neutralised it is much esteemed for lubricating and is always preferred to cotton seed oil. It is also largely used in the manufacture of soap, and is the characteristic component of the famous Marseilles white soap.—London *Times*, Oct. 13.

Dendrobium Densiflorum.—Mr Fraser Smith, The Gardens, Cullen House, Cullen, N B, encloses a photograph of Dendrobium densiflorum, grown by him, which this season has been much finer than usual, having twenty-one trusses of its beautiful yellow flowers. This is a special variety which he had sent him from Java, twelve years ago. It has much longer pseudo-bulbs, and larger trusses of flowers, which are richer in colour than in any other variety. The plant has flowered regularly for the past ten years.—*Gardeners' Chronicle*, Oct. 13.

Uganda Coffee: Best in the World.—The development of the coffee-growing industry in tropical Africa is interesting as showing the rich resources of that region for plant production. The first coffee seed was introduced from Kew by missionaries less than five years ago, and from it have sprung the extensive crops now under cultivation. Last season the quantity exported from Uganda alone was over one hundred tons, which will be greatly exceeded by this season's production. Experts say that the quality of the Blantyre coffee is the finest the world can produce, the flavour being superior even to the famous Mocha. The great drawback is the lack of transport, which, however, will be met by the completion in the near future of the Uganda Railway.—*Daily Mail*, Oct. 8.

Egyptian Phosphate Deposits.—*The Egyptian Gazette* of Oct. 10th, contains the following interesting information:—

The Survey Department has just issued a Report on the phosphate deposits of Egypt. The Report contains the result of the investigations of the members of the Survey in the Keneh Moudirieh, in the districts between Keneh and Kosseir, and in the Dakhleh Oasis. In the concluding chapter containing the chemical Report on the phosphates the writer, Mr. A. Lucas, says, "The native phosphates will be useful to all classes of Egyptian agriculturists. They will be useful to the Fellahin and small farmers who know nothing of superphosphates, nor would be able to pay for them if they did, for to these classes the choice is not between an imported soluble phosphate and a native insoluble phosphate, but between this latter and none at all They will be useful also to those who do know and can appreciate the difference between a soluble and an insoluble phosphate, but whose conditions of work are such as to make the cost of imported manures prohibitive, and for whom it is no longer a question as to which of the two gives better results, but whether it is not wiser to use what lies at their feet rather than to allow their land to become impoverished. And to the large landowners the native product will be of value in supplementing the imported and high priced article. I am strongly of opinion therefore that these recently discovered phosphates ought to prove of great value to Egyptian agriculture, for the following reasons:—

1. They occur in immense quantities.

2. With the exception of those found in Sinai and Dakhla they are easy of access and fairly close to the river and railway.

3. By means of a very inexpensive operation, namely, simple grinding, they can be prepared ready for use.

4. They constitute a really valuable and cheap manure of a kind that is much needed.

5. No other phosphatic manure of similar value exists in the country and the price of imported phosphate manures is such as to render them in many cases prohibitive.

The Garton Lectures on Colonial and Indian Agriculture in Edinburgh University—is the heading of a paper by Robert Wallace, Professor of Agriculture and Rural Economy in the *Asiatic Quarterly Review* from which we learn:—

The expiring century seems an auspicious occasion for the new departure which has been made by the establishment and liberal endowment by Mr. Robert and Mr. John Garton, of Newton-le-Willows, Lancashire, of a course of about fifty lectures on "Colonial and Indian Agriculture" which are to be initiated in the current month in connection with the chair of Agriculture and Rural Economy in Edinburgh University. The first half of the course, which will be delivered by the Professor of Agriculture before the end of December, will be inaugurated on October 18 by an address on "Famine in India," a subject likely to prove of peculiar interest at what, let us hope, may be the closing epoch of the most prolonged, if not the most disastrous, of the recurring trials of physical endurance from starvation to which our Indian peoples have been periodically subjected. The ordinary work of the class will begin with a general view of the agriculture of India, including the main features of the Presidencies and other great political divisions, with special reference to geology, soil, climate, peoples, and chief products.

Further on we are told:—

The smaller Crown Colonies will not be neglected, and the second section of the course will close with a discussion of such miscellaneous subjects as exports of agricultural produce from the Colonies and India, and the relations of the agriculture of the Colonies and India to that of the Mother Country.

The Truth about Ramie.—We were always more or less suspicious about the glowing accounts given of the fortunes in "ramie" or "rhea" fibre, and we regret, in the interests of producers, and especially of plucky pioneers, both in Ceylon and elsewhere, that the following discouraging bit of news comes to us from a Bradford correspondent of Sell's *Commercial Intelligencer*, who writes in the latest issue as follows:—

For the sake of planters in our colonies and investors at home a few words in review of the history and possibilities of ramie may not be out of place. From the manufacturer's point of view the business career of ramie can only be regarded as catastrophic. No single English firm has yet succeeded in dealing profitably with the material, and it is quite within the truth to say that a quarter of a million sterling has been irretrievably lost in the attempt. To put the comparison with cotton in a nut-shell: raw cotton can be made into yarn for some 2½d per pound; ramie costs in process at least 1s per pound. To compare the possibilities of ramie with wool and with silk betrays a complete ignorance of the nature of these two materials. Ramie is harsh and wiry, with none of the warmth and softness of wool or the beauty and pliability of silk. Ramie is much dearer than flax, and has the unfortunate faculty of shrinking when wet; its lustre is metallic in appearance, and ramie cannot be dyed to a good black. Seven English firms to the writer's own intimate knowledge have ruined themselves in ramie. Indeed the seven may be extended to ten, if change of hands be calculated. Two concerns in Germany are moderately successful with the material, the process employed being the familiar one of carding in lieu of combing the "filasse." The Teutonic quasi success is attributable to cheap power, cheap labour, and to the fashion in yarn and fabrics differing from English canons. Ramie booming is a perennial event, and it is as well to let the seamy side see light once in a while. Chapter and verse can be given in substantiation of the statements above—samples, prices, and all particulars.

Chinese Hemp, or Ramie Grass.—Ramie grass, ro hemp, as it is called in the Customs returns, has increased steadily, says a consular report from Kiukiang (China), during the past few years. It is cultivated largely in the adjoining province of Hupei, and shipped from Kiukiang to the Shanghai market, whence it finds its way to Japan, Canton, Chinkiang, and other Chinese ports, where it is turned into the grass cloth so much worn by natives during the hot weather. Three crops are gathered during the year; the first, which is planted in the previous autumn, comes to perfection about the middle of June, the second in July, and the third about October. The second crop is inferior to both the others, as it only remains in the ground about a month and the excessive heat stunts its growth. The first is generally the best, and in good seasons attains a height of 70 inches. It is made up in bales according to length of the stalks, and fetches from 12 to 10 taels per picul of 133 lb., the price depending upon the market in Japan, whither about 60 per cent of the total out-turn is exported. The second and third crops average about 11 to 8 taels per picul. The Consul adds, "I have only heard of one consignment having been made to the London market. German merchants are said to be purchasing it in Shanghai, and one trial shipment has been made to Hamburg direct from this by a native hong, which practically monopolises the trade here. Account sales have not yet been received, so it is not yet known how the venture has turned out." The quantity shipped in 1895 was 37,009 piculs; in 1896, 46,668 piculs; in 1897, 48,925 piculs; in 1898, 57,400 piculs; and in 1899, 70,156 piculs.—*Chamber of Commerce Journal* for October.

Mangoes for England.—The London correspondent of the *Bombay Gazette*, writing on October 12th, says a conference between Mr. Tata and the Peninsular and Oriental Company on the question of establishing the export of mangoes from Bombay on a commercial basis which, in the course of the summer, was mentioned as likely to be held this autumn, duly came off this week. There were present Sir Thomas Sutherland, Sir Owen Burne, and other Directors of the P. and O. Company, as well as Mr. Tata and Sir George Birdwood. Nothing can be formally decided in the matter until it has been brought before a meeting of the Board, which will probably be held today, but I understand that the basis of the arrangement come to is that Mr. Tata and those associated with him will guarantee a shipment of 500 tons of mangoes and other merchantable Bombay fruits, the P. and O. Company during the next mango season, say April 25th to June 5th, providing for one or two of their refrigerator steamers engaged in the Australian meat, butter, and fruit trade calling on their homeward voyage at Bombay. Mr. Tata is now engaged in coming to an agreement with some of the London fruit-importers, but it is hoped he may be able to do better than that by establishing reciprocally advantageous relations with one of the great co-operative stores in the Metropolis. It would probably be easy to dispose of 500 tons of good mangoes in the West End alone in a single day at one shilling each. A few mangoes sent to a Bond Street shop last summer were almost instantaneously sold off at five shillings each, and stringy turpentiny Madeira mangoes now on sale in various London shops are selling at one to two shillings a piece.—*Pioneer*.

PLUMBAGO MINING IN CEYLON.

VIEWS OF AN EXPERT.

Mr. Alfred J Hodgkinson-Carrington, C.E., M.E, A.M I.C.E., M.A.I.M.E., of 26 Bloomsbury Square, London, W.C., who arrived in the island on the 12th October by the P & O steamer "Rome" from Australia, again made a brief stay at the Bristol Hotel, having returned from a visit of inspection to the Moragalla Mines; and, after revisiting the mines, he left for England on the 22nd ult. Asked for an expression of opinion concerning the plumbago industry in Ceylon, Mr. Carrington stated to our contemporary that owners of mines are working by

EXCEEDINGLY PRIMITIVE METHODS.

They apply absolutely no scientific methods in the working of the mines, and, unfortunately, whatever machinery is used, has been put up by men who did not thoroughly understand mining engineering. This had, naturally, caused a general prejudice among natives—miners and mine-owners—against any innovations in the methods of working, or the introduction of mining plants to assist them in their operations.

"There are very many mines in the Colony," said Mr. Carrington, "which have been worked by the primitive methods to a certain depth, and then abandoned, just at the stage when the working should have proved remunerative if under skilled direction and with proper machinery. This has a very prejudicial effect on plumbago mining in the island generally, and must be a source of great loss to the community at large, and those engaged in mining in plumbago particularly. Such English Companies as own mines in Ceylon are taking steps for the working of their mines on a more highly-skilled basis, and it would be largely to the interest of the natives, who are the owners of the most valuable mining properties in the Island, if they would follow the example of their European *confrères.*"

EFFICIENCY OF NATIVE MINERS.

Continuing, Mr. Carrington said he knew of several instances where good mines have been lost through the want of improved methods of working. He has been rather struck with the efficiency of most of the native miners in different parts of the island. Thus it was not for the lack of good labour that the industry is at present in a crude state, for the native miners under proper scientific supervision would be able to do good work.

A SUGGESTION.

The method of working in shifts of twenty-four hours is prejudicial to the health and efficiency of the miners. This custom might be discontinued with mutual advantage to miners and mine-owners.

Mica-Mining in S. India.—The Mica-mining community in the Hazaribagh and Gaya District numbers 42 Europeans and 7,500 natives. It is in contemplation to form a Mica-mining Association for the purpose of representing the views of this body to Government in all matters relating to the industry.—*Madras Mail*, Nov. 14.

PLANTING NOTES.

Benefit of Criticism to the Tea Industry.—All matters connected with the tea industry, says the *Indian Planters' Gazette*, are having the sharp shears of criticism applied to them, and they will come out of the ordeal all the better for the "pruning": like the tea bush itself, the industry will be all the better for the cutting, and, like the tea bush, will prove itself ever green, taking a fresh lease of life and all the better for the change. This is why we have such hope in the industry, the more it is assailed the better it will thrive. The old rotten time-worn branches, useless twigs, and leathery leaves being cut away and thrown aside, the tree itself will spring afresh into a new and vigorous life and yield abundantly. Pessimists would have us believe that tea is played out, but such is as far from the case as an old tea bush may be said to be played out. It only needs the knife to renew its youth.

Stone-cutting and Polishing.—An excellent little manual of instructions upon this subject, by Mr. Geo. Day, F.R.M.S., has reached us from the publishers, Messrs Dawbarn & Ward, 6, Farringdon Avenue, E.C.—price 6d. It forms No. 26 of the Useful-Arts-and-Handicraft Series. Nos. 1-13 and 14-25 are bound in two volumes (post free, 8s) and form a possession, than which no more excellent gift could be made to the carpenter, smith, or other serious or fancy worker in wood, steel and even stone. Single numbers are sold at 6d each. Stone-cutting is a little more difficult than the mere polishing of a pebble, and it may be developed into very elaborate and artistic work. It is undertaken for various purposes, principally:—

1. To provide a large flat surface (or two surfaces) for polishing, without having to grind away a large proportion of the pebble.

2. To slit stones into thin layers, increasing their translucency and beauty.

3. To give stones several angles or facets, giving variety in coloring and reflection.

4. To fit the stone for setting, as a personal ornament or for some useful purpose.

The quotation of the following "table of hardness" may indicate to some extent the great usefulness of the knowledge which the booklet set forth, as well as the simplicity of treatment:—

1 Talc (jet, cannel coal, steatite, etc.)—Easily broken or scratched with finger-nail.

2 Rock Salt—Scratched with difficulty by the finger-nail, but readily cut with a knife.

3 Calcite—Not to be scratched with finger-nail, but easily with a knife.

4 Fluor Spar—Can be but slightly scratched with knife, but easily attacked with a file.

5 Apatite—Does not scratch glass, or only faintly; does not give out sparks against steel; easily scratched with flint.

6 Felspar—Easily scratches glass, is scratched by a file, and gives some sparks against steel.

7 Quartz (agate, jaspar, chalcedony, etc.)—only slightly scratched by file; gives sparks readily against steel.

8 Topaz—Very hard; is not scratched by file.

9 Sapphire—Hardest of all except the diamond; scratches all other stones.

10 Diamond—Scratches all minerals, but is not scratched by any.

Correspondence.

To the Editor.

PROTECTION OF BIRD-LIFE.

La Martiniere College, Lucknow,

November 1st, 1900

DEAR SIR,—The Government of India is desirous of making a further enquiry into the question of the destruction of the bird-life of this country. It is probable that, if a proper case be made out, further restrictions will be placed on the indiscriminate slaughter of birds for their plumage—a policy which has had such disastrous effects in other countries.

The Government has requested that a report on this matter be compiled as soon as possible, and, in order that such may bear due weight, it has been determined to obtain the opinion of as many of the leading ornithologists in this country as possible.

Feeling assured of the great interest that you take in the welfare of the birds, I venture to ask you to be so kind as to peruse the following questions and to return to me your opinions as early as possible.

(I) Are you aware of any trade in birdskins, or feathers, being carried on in any district, and, if so, where?

(II). Is the trade, if any, increasing or decreasing?

(III). If you know of any regular destruction of birds, please name the principal species affected, and furthermore state whether any of them are threatened with extinction,

(IV). What effects have you noticed on the bird-life of closed or reserved forests, as a result of the latest Government regulations?

(V). Has the destruction of any particular species in any way affected the agriculture of a district, either for good or ill?

(VI). Are there any tribes, or castes, in your district (if so name them) whose time honoured and immemorial custom it has been to destroy birds for the sake of their plumage?

(VII). Do you think it likely that an act restricting the destruction of bird-life would be received favourably by the natives in your district, or do you think that any such legislation would be regarded as oppressive and an interference with tribal customs?

(VIII). Do you think that, even if there is no trade in feathers in your district at the present moment, that the conditions are such that the trade if established would prove profitable to the merchant, and inimical to bird-life?

(IX). Do you think that it would be advisable to introduce measures restricting the destruction of birds, they would such action in your opinion be unnecessary?

Trusting that you will give this letter your fullest and most careful consideration.—I have the honor to be, Your most obediently, WILLIAM JESSE.

GOURAMI FISH FOR CEYLON:—A QUESTION FOR THE CEYLON FISHING CLUB.

Oxley Island, Nov. 3.

DEAR SIRS,—I fell in today with a volume, six months of 1898, of your *Tropical Agriculturist*, and was much interested in looking through it. On page 432 I was reminded of a forgotten promise to report the result of the frog experiment: pray pardon my faulty memory. I regret to say only a few of the frogs lived, and they, after a few weeks, disappeared.

I read with interest "C.D."'s letter about the Gourami. I presume you have by this time acclimatized it in Ceylon. If not, I may be able to assist you in the matter. I am thinking of going to England about March next, and would be willing to take a sufficient number, say fifty to eighty, to establish them in Colombo. I would undertake to do this for twenty-five pounds, delivered on board the ship into tanks supplied to me: a couple of *tin*, not zinc, lined boxes about 3ft. by 2ft. by 2ft. would do. I purpose taking ceratodus to England and the gourami might share their tanks to Ceylon. If you know of anyone (or any club) that will agree to this proposal, please inform me at your earliest convenience so that the necessary arrangements may be made. The Superintendent at the Zoological Gardens, London, informs me that their two ceratodus, also those in Paris, which he had recently seen, are alive and well.—Yours faithfully,

D. O'CONNOR.

"THE THEORY OF MANURING" (AND FARMYARD MANURE).

Colombo, Nov. 9th.

DEAR SIR,—Referring to the extract from the "Journal of Horticulture" dealing with the composition and manurial value of Farmyard Manure, we beg to give below for comparison seven analyses of cattle manure, A made by Mr. John Hughes, B made by Dr. Ruempler C D, and E by Mr. Cochran, F, the analysis quoted in the *Observer*, and G, an analysis recently made by Dr. Koller, in charge of our Hultsdorf Mill's Laboratory:—

ANALYSIS OF CATTLE MANURE: PROPORTION OF NITROGEN, PHOSPHORIC ACID AND POTASH.

Manure.	Water.	Phosphoric Acid.	Nitrogen.	Potash.	Analyst.
	per c.	p. c.	p. c.	p. c.	
(A) Sun-dried Indian Cattle Manure	7·22	0·54	1·47	0·63	Mr. Hughes
(B) European Cattle Manure with litter	?	0·32	0·68	0·80	Dr. Ruempler
(C) Ceylon Cattle Manure No. 1	80·4	0·25	0·45	0·95	Mr. Cochran
(D) Ceylon Cattle Manure No. 2	74·67	0·09	0·64	1·07	Do
(E) Ceylon Cattle Manure No. 3	67·00	0·08	0·47	0·36	Do
(F) Farmyard Manure	?	0·22 to 0·36	0·40 to 0·58	0·4 to 0·53	From the "Journal of Horticulture"
(G) Ceylon Cattle Manure from Upcountry	50·34	0·85	0·33	0·41	Dr. Koller

To facilitate comparison of the respective value of the different cattle manures, we have reduced the percentage of samples A, C, D, E, and G. to the amount of lb. nitrogen, phosphoric acid and potash present in a ton of cattle manure dried at 212° F.

ANALYSIS OF CATTLLE MANURE, DRIED AT 212° F.: PROPORTION OF LB. NITROGEN, PHOSPHORIC ACID AND POTASH PER TON MANURE.

Manure.	Phosphoric Acid.	Nitrogen.	Potash.	Analyst.
	lb.	lb.	lb.	
(A) Sun-dried Indian Cattle Manure	13·04	35·49	15·21	Mr. Hughes
(C) Ceylon Cattle Manure No. 1	28·70	51·66	108·56	Mr. Cochran
(D) Ceylon Cattle Manure No. 2	7·96	56·59	94·62	Do
(E) Ceylon Cattle Manure No. 3	5·43	31·90	24·44	Do
(G) Ceylon Cattle Manure from Upcountry	15·79	15·15	18·09	Dr. Koller

Now the comparison of these analyses shows a remarkable difference between the various manures. It is most marked in the percentage of potash and nitrogen, due no doubt to a large amount of urine in samples C. and D.

As regards the percentage of nitrogen in cattle manure, this partly depends on the age and food of the cattle, but to a great extent on the loss of nitrogen which has escaped into the air in the shape of ammonia. This loss in nitrogeon which we estimate at 9½ lb. nitrogen per ton manure equal to 40½ lb. sulphate of ammonia, can be easily prevented by the use of an ammonia-fixer.

But even then one ton cattle manure per acre would be insufficient to maintain so much as a small crop. Unless several tons are applied per acre, the soil will be more and more impoverished by each successive yield. To strengthen the plants and thus produce a larger yield, artificial manures should be used. The amount of plant food in cattle manure varies so much that planters can never know what they are buying in cattle manure, while artificial manure has the advantage that it can be purchased on guaranteed analysis. However, if cattle manure can be procured at a low rate, it can be applied along with artificial manure. We take the value of one ton cattle manure to be as follows:—

7½ lb. Nitrogen, equal to 36 ½ lb. Sulphate of Ammonia	R4·00
7½ lb. Phosphoric Acid, equal to 17½ lb. Conc. Superphosphate	R1·42
9 2 lb. Potash equal to 18½ lb. Muriate of Potash 50 to 52 per cent potash ...	R1·24
	R6·66

If an Ammonia Fixer has been used about 8 to 9½ lb. nitrogean equal to 39 to 46 lb. sulphate of ammonia should be added which have a value of R4·26 to R5. The total value would be R11·66 outside and we doubt whether at this figure cattle manure can be procured in Ceylon.

FREUDENBERG & Co.,
Hultsdorf Mills, Manure Works.

THE TONGAN BEAN: A USEFUL VEGETABLE.

Gampola, Nov. 5.

SIR,—I desire with your permission to bring to the notice of the public the merits of "The Wonderful Tongan Bean" introduced into Ceylon by our enterprising florist and seedsman, Mr. E Spearman Hughes of Kandy. The Tongan Bean is a native of Tonga, and it admirably suits our climate and soil, and its cultivation on a large scale will profitably pay. It is a hardy evergreen perennial climber producing immense quantities of large flat beans of an excellent and nutritious quality, simply used like our French Beans. In a moderately warm climate and good soil, I estimate that a few plants of this bean will supply a whole family with its delicious, wholesome, and nutritious vegetable for about eight to nine months in the year It is also a lovely ornamental plant; I have many trained on bowers and trellis fences surrounding my bungalow. The beans are very delicious when picked very young, and boiled whole. The seeds are slow to germinate, so I have carried out Mr. Hughes' instructions in soaking them in hot water before planting, and have met with remarkable success in raising heavy crops. I can confidently recommend them to any one requiring beans of a special quality for their gardens.

I have also some plants of the velvet or magnet beans just now, and will be able to give the public some details of its merits in my next.—I am, sir, yours faithfully, H G.L

HEAVIEST YIELD OF TEA.

18th Oct.

DEAR SIR,—Can you, or any of your readers, give the highest yield ever given by tea, (Ceylon or India.)

1. By an estate of 300 acres or upwards?
2. By a field of 28 acres or upwards?

Yours truly,
"BY DAND."

[Surely, Mariawatte, Gampola, answers the description? See figures in our "Handbook and Directory" where it will be found that the 100=acre field has yielded an average of 1,137 lb made tea for 14 years; while over the whole estate or 450 acres about 930 lb. have been made per acre.—ED. *T A*]

CINCHONA PLANTERS AND QUININE MANUFACTURERS:

PROSPECTS OF BARK AND A WORD OF WARNING.

SIR,—It is now some years since I predicted that the Quinine Manufacturers would kill the goose that laid their golden eggs.

The advice was not taken to heart the continuance of large profits was insisted upon, necessitating a further depression of the unit and the consequence was that the goose died. When its actual decease took place, it is difficult to state; but there is ample evidence that the manufacturers have at last realised that the dear thing is dead, dead as a door-nail. Turning from metaphor to fact, nobody will deny in the face of the unit at present ruling, that consumption of quinine has over-taken production. Nor is there any doubt that it will do so to a far larger extent during the next five or six years, for that at the least is the period necessary to bring matters to a state of fair balance again. The reason for this is evident; it takes five to six years under the most favourable circumstances to grow cinchona fit to bark. Some of the quinine manufacturers may see fit to doubt this statement of supply and demand and no doubt think that as in the good old days, they need only raise the unit for a time to induce large harvesting and shipment, and thereupon will be able to knock it down again and secure the large profits, incidental to this often-

repeated manœuvre. But they leave out of consideration, that, although they have grown fat and sleek upon it in the past, many cinchona planters have been ruined by it and their estates abandoned or planted up with other products and though some, who have been able to last out, are now reaping mighty profits from their ability to do so, they are in the minority. Once more the move may be effective, but only once and it will accentuate the difficulty they will have to deal with afterwards.

What has been the reply of Java to a steadily rising unit? A decrease in shipments, as against the increase which manufacturers doubtless expected. The bark shipments from Java for the last nine months are a million and a half pounds short of what they were during the same period last year and a million lb. short of what they were the year before. These figures in themselves are instructive, for they show that last year Java tried its best to respond to a higher unit and did put in half a million lb. more, (thus enabling the manufacturers to again reduce the unit) only to fall short, all the more during the present year. I believe this fact has caused some astonishment everywhere, probably most of all in Java itself. It is largely due to a theory that a comparatively small number of large trees per acre would give the same amount of bark as, or more bark than a number of smaller ones. In very many places the thinning out of the smaller ones has therefore been quietly proceeded with and now that it is the turn of the large ones left, they are proving a disappointment. Nor is this strange; for it is not the bark on a large tree that is so much thicker and heavier than it is on a small one, it is the wood inside the bark. This is no doubt one of the reasons why oak is grown in coppice, when its object is to provide bark for tanning, though there are other reasons as well.

But by this, I do not wish it to be inferred that there is not a lot of bark left in Java: such a statement could be so easily disproved that there would be no object in making it. What I mean to indicate is that there is not the large amount of *superfluous* bark, either on the estates or held in stock that was expected. If there had been, it would have been rushed in and Java planters would have been unable to keep control of the market as they are now doing. It must not be forgotten that they serve two ends in doing so; they keep up the price of bark and they keep up the price of the quinine they themselves manufacture. That, no doubt is one of the most important factors in the situation, that they are no longer quite at the mercy of the quinine manufacturers in Europe, and they have probably all learnt the lesson that a lb. of bark at a 2d unit is equal to 3 lb. at a 1d unit as regards net results on every 4 per cent bark.

As to India and Ceylon, they are just now putting in rather more bark than usual; but that is a flash in the pan, which will not last. Stocks of bark are exhausted and the area under cinchona bark has dwindled to an insignificant acreage. Take for instance, the district that I write from. This was in past time, specially a district for cinchona, which with a rich soil and suitable climate was at its best. There were about 2,550 acres supplying a good deal of bark well known under the "Elephant Brand". Of these, there are only 1,100 acres left and even a great deal of this has deteriorated, and has been coppiced. Speaking well within the mark, I should say there was not more than 1-3rd of the bark in the district that there used to be. Any very large amount put into the market must therefore, of course, mean coppicing or uprooting. And, if this is the case in a district that made cinchona its speciality and, because of its rich bark and well grown trees, was able to hold out longest, no further illustration is needed, if what has happened in other districts even where cinchona has not died out of its own accord.

As I am one of those whose Cinchona prospects at all events have been ruined by the policy of the Quinine Manufacturers, I cannot be expected to look upon them with any particular favour. Yet, I cannot blame them for doing the best they could for themselves, even while I think they were unwise in their way of doing so. It will at all events be interesting to know what they intend doing in the future. Their wisest policy would undoubtedly be to be as generous as they can, to reduce their margin of profit to a minimum and thus by a good and stable unit to encourage the planting of as much cinchona as possible in the near future and the cultivation of every cinchona tree in existence. It is, of course, impossible to tell what stocks of quinine they hold and what of bark; but although these will form a larger factor in their calculation, they must put them against a period of, as I have stated, five to six years of decreased production and a steadily increasing demand. It will naturally be difficult for them to exercise the large-hearted policy I advocate; yet in their own interests if not in the interests of humanity, it is necessary. Any manœuvre, tending towards a rapid overthrow of the unit from its present position, would decrease the amount of cinchona which will otherwise be planted out in the near future. Whereas an expression of opinion on their part and a desire shown to equalise profits as between themselves and the growers and to keep the unit up for some years to come, would foster schemes of planting. It would also prevent the owners of cinchona from rushing at their trees and cutting them down, so as to have their bark in, while the good times last. By this it would tend to keep the supply of bark up during the time the new openings will require to grow into bearing. There is, however, another factor to be considered by the quinine manufacturers and that is the deterioration of cinchona generally and especially the deterioration of available seed.

They may rest assured that a large amount of the cinchona planted out recently and a larger amount of that about to be planted out in the near future, will not grow into anything worth barking. And even where good seed can be obtained and good plants raised there will not be much suitable land available. All this the planter knows; but the manufacturer does not know. It would probably be to the interest of the manufacturers if they were to send a capable man round the Cinchona Districts of the World and get a reliable report made for them. This, they should, in fact, have done a couple of years ago, or more, when they could and would probably as a result have bought up a very large acreage at very low prices. That chance they have allowed to pass, nobody is likely to part with cinchona now, excepting at a very high figure. But apart from the basis of calculation which such a report would furnish them with, a basis, which I feel sure would agree with my views as above given, they could probably do a good deal to promote planting up of suitable land or acquire such land and get it planted up for themselves. It may be asked "Que diable prit il donc dans cette galère?" Why should this cinchona planter go and advise the quinine manufacturers what to do in their own interests, instead of leaving them alone to reduce the production of bark still further by promoting a rush of harvesting "à tout prix." He surely, knowing all that he says, he does, would hold his bark and come in at the fabulous prices that would ensue.

In answer to this I would state my belief that it is better for the general success of trade in any article of commerce, that there should be a certain amount of stability as against sudden rushes up and down. Such stability, would I believe, be promoted by the policy I suggest.

Again, I think it is doubtful whether a unit ruling much higher than the present one could be a lasting benefit to the cinchona planter. I do not believe that the present price of quinine will have any affect on its consumption, but if it went much higher this might occur.

Again, a considerable rise in the price of quinine and bark might lead to a renewed importation of large quantities of forest bark from South America and thus again slump the market, or it might lead to chemical production of quinine from that all-producing coal tar at remunerative prices.

I believe that it will be best for the Cinchona Planter to be content with the 2½d unit and the Quinine Manufacturer with the 1s 6d an ounce and it is with this object in view that I have written. Even these figures seem lacking in humanity, when so many thousands of fever-stricken are crying out for cheap quinine, but I have personally suffered too much by cheap quinine, not to feel that even a medicine should be distributed through the world at some profit to the producer.—Yours very truly,

J. VON ROSENBERG.

Manalé, near Devikolam, 7th November 1900.

PLANTING NOTES.

THE BOMBAY TEA COMPANY, LIMITED.—This Company, which is not an Indian company, as its name implies, but a retail trading company having branches in most of the Northern towns, has declared an interim dividend of 6 per cent per annum, on both preference and ordinary shares, being the same as previously. Dividend warrants were sent out on Friday, Oct. 26th, 1900. —*Grocers' Journal*, Oct. 27.

THE TEA PLANTER.—The *Revue des Cultures Coloniales* for August 5th has an article on tea, giving an outline of an elaborate paper by Mr. Jules Koch that appeared in Engler's *Botanische Jahrbuch* (Botanical Annual). "On the Genus Tea and China Tea." The article, it seems, is very carefully drawn up, in its original (Wilhelm Engelmann, Editor' Leipzig).

GOURAMI FISH FOR CEYLON.—We direct the attention of pisciculturists, and especially the members of the local Fishing Club, to Mr. D. O'Connor's letter elsewhere. We saw no better way of finding out whether Mr. O'Connor's services were locally required than by the publication of his offer. The gourami is a very valuable tank fish and Mr. O'Connor has established a reputation as a zoologist and collector and for his success in carrying specimens of different kinds from Queensland to England and *vice versa.* It may be a question whether the Ceylon Government should not be approached with reference to the introduction of gourami into some of the village tanks? "C.D." will be interested in Mr. O'Connor's letter.—Part failure should not prevent a fresh trial.

THE LANKA PLANTATIONS CO, LTD.

ANNUAL REPORT.

Report presented at the Twentieth Ordinary General Meeting of the Lanka Plantations Company, Limited, held at the Office of the Company, on Wednesday, the 14th November, 1900, at twelve o'clock noon precisely.

1. The Directors now submit their Report for the twelve months ending 30th June last, together with the Balance Sheet and Accounts of the Company made up to that date and duly audited.

2. The coffee crop shipped to London amounted to 174 cwt. 3 qrs. 13 lb., and realised £573 8s 5d, Last year, the crop shipped was 722 cwt., and realised £2,843 16s 2d The acreage under coffee alone was nominally 120 acres, and of this, 70 acres are to be planted with tea this season, and the remainder next.

3. The total crop of cocoa gathered on Yattawatta amounted to 1,099 cwt., and realised £4,121 8s 5d. against 1,655 cwt. last year, which realised £5,5 9 18s 10 l. The cost of fourteen acres new land, and the net expenditure on clearings not yet in bearing, are charged to capital account. On the same estate 565lb. Cardamoms were gathered, realising £32 8s 4d.

4. The tea received from the Company's estates amounted to 947,194 lb., and has been sold at an average of 6·98 per lb. net, realising £27,566 4s 7d. Last year the Company received 769 578 lb. which was sold at an average of 7·44 per lb. net, and realised £23,862 4s 4d. The season was favourable, and the older fields are responding to the manure that has been applied to them.

5. The average rate at which drafts were negotiated on account of the season's crops was 1/4½, per rupee against 1/4 9·32nds last year.

6. The following statement shows the approximate acreage and state of cultivation of the Company's estates on the 30th June last, as per recent surveys

Estate.	Coffee.	Tea.	Cocoa.	Grass.	Chena and Patena & Waste.	Forest and Timber Trees.	Total.
Ampittiakande } Arnhall } ..	20	444	...	4	256	70	794
Fruit Hill ..	..	227	..	...	10	..	237
Fordyce, Garbawn, Gonagalla, and Paramatta ..	...	798	..	5	..	135	938
Rappahannock ..	...	322	..	31	30	90	473
Rillamulle ...	...	195	..	..	343	22	560
Thotulagalla ..	100	281	..	..	64	111	556
Yattawatte ..	...	...	757	95	309	82	1,237
	120	2,267	751	135	1,012	510	4,795

7. The net profits for the past year amounted to £7,511 0s 2d, to which must be added the sum of £952 1s 6d the balance brought forward from the year 1898-99, making together £8,463 1s 8d.

8. Having already paid a half-year's interim dividend on the Six per Cent. Preference Shares to the 31st December, 1899, amounting to £426 6s 0d, the Directors recommend payment of the Dividend on these shares to 30th June last, requiring (less property tax) £422 12s 6d, and having deducted in anticipation £999 4s 5d, being one-tenth of the sums charged to Suspense Account during the ten years ending 30th June, 1900, they further recommend a divident of 8s per share, being 4 per cent (free of income tax) on the Ordinary Shares, amounting to £6,000, carrying forward a balance of £6'4 18s 9d to the next account.

9. Mr. Edward Pettit, the Director retiring on this occasion, being eligible, offers himself for re-election.

Mr. John Smith the Auditor also retires and

being a shareholder offers himself for re-election. —By order of the Board,

C. M. ROBERTSON, Secretary.

12, Fenchurch Street, London, E.C, 2nd Nov., 1900.

THE CENTRAL PROVINCE CEYLON TEA COMPANY. LTD.

REPORT OF THE DIRECTORS

to be submitted to the Shareholders at their fourth annual ordinary general meeting, to be held at Botolph House, Eastcheap, E.C., on Monday, the 5th November.

The Directors beg to submit to the Shareholders the audited accounts for the year ending 30th June, 1900. The total crop of tea from the estates for the past season was 843,388 lb., against 780,395 lb. of the preceding year, being an increase of 62,993 lb The total sales, including bought tea, were 1,206,555 lb , averaging 5·683d per lb., being ·71d less than last year, equal to a loss of profit on the estate crop of over £2,000 by the fall in price alone. As regards cocoa, the crop amounted to 315 cwt., against 533 cwt. last year, the average price being 66s 9d per cwt. as against 58s 4d. There were during the season 243 acres of tea not yet in full bearing. The profits have again been slightly affected by a higher rate of exchange, which averaged 1s 4·34d per rupee as against 1s 4·23d last season. The net profits for the year amount to £3 850 2s which with £1,873 4s 9d brought forward from last year, shows a sum of £5,723 6s 9d to be dealt with. Of this amount £1,500 has been applied to the payment of an interim dividend at the rate of 6 per cent per annum on the Preference shares to 31st December, 1899. The Directors now recommend a dividend of 6 per cent per annum on the Preference shares to 30th June, 1900, and a dividend at the rate of 2 per cent per annum on the Ordinary shares, together absorbing £2,500 and leaving £1,723 6s 9d to be carried forward to next account, as against £1,873 4s 9d last year. The Colombo Agent and Director, Mr. F M Mackwood, is now in England and he states that the Company's places are in good order as to roads, drains, buildings, &c.

COLOMBIAN RUBBER CO, LD. (67,537).—Registered Oct. 23, with capital £100,000, in £1 shares, to adopt an agreement with the Compagnie Generale des Caoutchoucs de Colombie to develop and work, by extraction, cutting or otherwise, rubber forests in Colombia or elsewhere, and to carry on the business of rubber planters, growers, cultivators and merchants, timber merchants, saw-mill proprietors, etc.—*Investors' Guardian*, Nov. 3.

RAINFALL RETURN FOR COLOMBO.

(*Supplied by the Surveyor-General.*)

	1895.	1896.	1897.	1898.	1899.	Av of 30yrs.	1900
	Inch.	Inch	Inch	Inch	Inch.	Inch.	Inch.
January ..	5·00	2·92	3·81	2·32	6·98	3·22	3·72
February ..	0·81	0·35	1·68	1·98	2·78	1·93	0·63
March ..	1·84	5·64	3·66	4·21	0·88	4·78	3·71
April ..	9·34	5·93	10·97	22·81	6·66	11·31	15·12
May ..	10·09	9·31	8·30	5·80	17·73	12·09	10·63
June ..	13·09	8·37	10·14	10·94	9·23	8·37	7·83
July	0·52	2·85	5·24	6·15	1·11	4·38	6·77
August ..	0·92	6·35	9·09	0·97	0·62	3·67	7·35
September	4·09	10·99	4·58	6·90	1·48	5·01	4·00
October ..	20·36	16·78	4·71	20·60	12 99	14·52	9·47
November..	5·83	19.81	11·66	17·38	8·58	12·66	7 76*
December..	9·44	11·76	8·30	3·65	4·44	6·39	
Total..	92·23	101·06	82·73	103·11	73·48	88·33	76·99

* From 1st to 28th Nov. 7·76 inches, that is up to 9-30 a.m, on the 29th Nov.—ED. *C.O.*]

Ceylon Rainfall.

THE P. W. D. METEOROLOGICAL OBSERVATIONS FOR OCT 1900.—We append the Monthly Return of rain from which it will be seen that the highest fall in Oct. was at Padupola in the Central Province, 23·32 inches, and the lowest at Madawachchiya in the North-Central Province, 0·75 inches.

WESTERN PROVINCE.

Negombo, Mr. Bucknall (6) ... 9 64
Kalutara Mr. Emerson (36) .. 12 62
Labugama, Mr. Bond (369) ... 17·79
Henaratgoda, Mr. Silva (33) .. 13·20

CENTRAL PROVINCE.

Katugastota. Mr. Morgan (1,500) ... 10·50
New Valley, (Dikoya) Mr. Ward (3,700) .. 19 01
Helboda (Pussellawa) Mr. Gosset (3,300) .. 14·88
Yarrow Estate. .. Mr. Padwick (3,400) 13 80
Peradeniya Mr. ... MacMillan (1,540) ... 8·42
Duckwari, Mr. Edwin (3,300) ... 14·19
Caledonia, Not received (4,273) .. —
Pussellawa, Mr. .. Powell (3,000) .. 9 27
Hakgala, Mr. .. Nock (5,581) ... 7·97
S. Wanarajah Estate, Mr. Tatham (3,700) .. 12 89
Padupola, Mr. Ward .. (1,636) ... 23·32
Mylapitiya, Mr. Fletcher (1,767) ... 1·85

NORTHERN PROVINCE.

Mullaittivu, Mr. Ebert (12) .. 5·44
Jaffna Mr. Macdonnel (8) 10·73
Mankulam, (N. Read) Mr. Ebert (167) ... 14·50
Elephant Pass, Mr .. Silva (7) .. 13·32
Vangalachettykulam, Mr. Oorloff (179) .. 4·30
Point Pedro Mr. Chitampalam (24) ... 3·59
Jaffna College, Mr. Hastings (9) ... 9·95
Kayts, Mr. Kretser (8) .. 5·45
Kankesanturai, Mr. Pararachasinghe (10) .. 5·65
Pallai, Mr. Silva (24) .. 19 41
Murikandy, (North-Central Road) Mr. Silva (7) 7·25
Nedunkeni, Mr. Ebert (122) ... 21·90
Chavakachcheri, Mr. Silva (16) ... 9·47
Udupiddi, Not received (35) .. —
Marichchukaddi, Mr. Lampue (14) 6·47
Murungan, Mr. Walker (52) 8·25
Vavuniya Mr. Ebert (318) 6 08

SOUTHERN PROVINCE.

Ella Vella Mr. Caldicott (262) 9·65
Kekanadura, do (150) 5·13
Denagama, do (286) 9·84
Udukiriwila Mr. Leurensz (235) .. 6·76
Kirama, Mr. Lorensz (260) 14·46
Hali-ela Mr. Caldicott (200) 14·14
Tissa Mr. Silva (75) 16 27
Matara Mr. Caldicott (15) 8·91
Dandeniya, do (157) 8·88
Urubokka, Mr. Caldicott (890) 17·93
Tangalla Mr. Russell (94) 2·88
Mamadola, Mr. Doole (56) .. 11·87

EASTERN PROVINCE

Irrakkamam. Mr. Bower (42) ... 6·46
Devilana, Mr. Vanderstraaten (136) 5·49
Sagamata, Mr. Bower (40) ... 5·53
Ambare, do (65) 7·00
Kanthalai, Mr. Carte (150) 3·24
Allai, Mr. Carte (95) 7·45
Rukam, Mr. Vanderstraaten (120) ... 4 40
Periyakulam, Mr. Carte (20) ... 6·06
Chadaiyantalawa, Mr. Goodman (57) 3·03
Kalmunai, do (12) 6·60
Rotewewa, Mr Bower (30) 5·64
Lahugala, do (70) 7·30
Naulla, do (30) 5·20
Andankulam, Mr. Carte (41) ... 4·80
Manalpuddy, Mr. Vanderstraaten (21) 1·91
Maha-Oya-Tank, Mr. Vanderstraaten (190) 8·76
Potuvil, Mr. Sinnayah (10) 5·71

N.-W. PROVINCE.

Magalawewa, Mr. Soopenayan (176) .. 11·15
Maha Uswewa tank, Mr. Adams (160) ... 11·60
Tenepitiya. Mr. Churchill (8) ... 12·65
Batalagoda, Mr. Madahapola — 17·48

N.-C. PROVINCE.

Kalawewa, Mr. Chellappah (268) 7·94
Maradankadawala, Mr. Emerson (443) ... 4·49
Mihintale, Mr. Ondaatje (354) .. 2·55
Horowapotana, Mr. Ondaatje (217) .. 4·27
Madawachchiya, Mr. Mackride (285) .. 0·75
Topare, Mr. Jayewardane (200) .. 12·35
Minneriya Mr. Eves — 9 64

UVA PROVINCE.

Bandarawela, Mr. Tocke (4,000) 10·91
Haldummulla, Mr. Viramuttoo (3,160) 13·98
Kumbukan, Not received (445) ...
Koslanda, Mr. Edge (2,258) ... 16·42
Tanamalwila, Not received (550) .. —
Bibile, Mr. Silva (680) 12·52
Taldena, Mr. Fernando (1,100) .. 8 73
Alutnuwara—Mr. Leembruggen (300) 12·59

SABARAGAMUWA.

Ambanpitiya, Mr. Gregson (729) 17·74
Pelmadulla, Mr. Roberts n (480) 16· 9
Kolonna Korale (Hulanda-oya) Mr Dabre (203) 10·74
Avisawella, Mr. Clarke (105) .. 20·74

SHARE LIST.

ISSUED BY THE

COLOMBO SHARE BROKERS' ASSOCIATION,

CEYLON PRODUCE COMPANIES.

Company	paid p. sh.	Buyers.	Sellers.	Transactions
Agra Ouvah Estates Co., Ltd.	500	—	1000	...
Ceylon Tea and Cocoa nut Estates	500	—	—	—
Castlereagh Tea Co., Ltd.	100	...	95	—
Ceylon Hills Estates Co. Ltd..	100	—	—	...
Ceylon Provincial Estates Co. Ltd.	500	500	510	...
Claremont Estates Co., Ltd.	100	—	—	—
Clunes Tea Co., Ltd.	100	—	75	--
Clyde Estates Co., Ltd.	100	50	—	—
Doomoo Tea Co., Ltd.	100	60	65	—
Drayton Estate Co., Ltd.	100	120	150	—
Ella Tea Co., of Ceylon, Ltd.	100	..	50	—
Estates Co., of Uva, Ltd.	500	—	250	250
Gangawatta	500	—	—	—
Glasgow Estate Co., Ltd.	500	975	—	—
Great Western Tea Co.,	500	—	625	625
Hapugahalande Tea Estate Co.	200	—	—	200
High Forests Estates Co., Ltd	500	...	600	600
Do part paid	350	—	425	..
Horekelly Estates Co., Ltd.	100	—	70	—
Kalutara Co., Ltd.	500	—	300	—
Kandyan Hills Co., Ltd.	100	—	70	—
Kanapediwatte Ltd.	100	—	90	—
Kelani Tea Garden Co., Ltd.	100	—	—	—
Kirklees Estates Co., Ltd.	100	—	120	—
Knavesmire Estates Co., Ltd.	100	—	65	—
Maha Uva Estates Co., Ltd	500	400	—	—
Mocha Tea Co., of Ceylon, Ltd.	500	700	725	—
Nahavilla Estate Co., Ltd.	500	—	375	—
Neboda Tea., Co. Ltd	500	..	500	..
Nyassaland Coffee Co. Ltd	100	—	—	—
Ottery Estate Co., Ltd.	100	—	—	—
Palmerston Tea Co., Ltd.	500	—	450	—
Penrhos Estates Co., Ltd.	100	—	100	—
Pine Hill Estate Co., Ltd.	60	—	50	—
Pitakanda Tea Company	500	—	—	—
Putupaula Tea Co., Ltd.	100	—	—	—
Ratwatte Cocoa Co., Ltd.	500	—	—	—
Rayigam Tea Co. Ltd.	100	50	55	...
Roeberry Tea Co., Ltd.	100	—	70	70
Ruanwella Tea Co., Ltd.	100	—	35	35
St. Heliers Tea Co., Ltd.	500	510	..	—
Talgaswela Tea Co., Ltd.	100	—	35	—
Do 7 per cent Prefs.	100	..	—	...
Tonacombe Estate Co., Ltd.	500	..	400	...
Udabage Estate Co., Ltd.	100	...	...	..
Udugama Tea & Timber Co., Ltd.	50	..	..	..
Uniou Estate Co., Ltd.	500	200	...	..
Upper Maskeliya Estate Co. Ltd.	500	—	450	..
Uvakellie Tea Co., of Ceylon, Ltd.	100	65	70	—
Vogan Tea Co., Ltd.	100	..	70	—
WanarajahTea Co.,Ltd.	500	..	1060	..
Yataderiya Tea Co., Ltd.	100	—	350	—

CEYLON COMMERCIAL COMPANIES

Company	paid p. sh.	Buyers.	Sellers.	Transactions
Adam's Peak Hotel Co., Ltd.	100	25	50	..
Bristol Hotel Co., Ltd.	100	...	125	120
Do 7 per cent Debts	100	107·50	...	...
Ceylon Gen. Steam Navgtn. Co., Ltd.	100	...	215	...
Colombo Apothecaries' Co. Ltd.	100	...	140	—
Colombo Assembly Rooms Co., Ltd.	20	15	..	...
Do prefs.	20	...	...	—
Colombo Fort Land and Building Co., Ltd.	100	—	92·50	—
Colombo Hotels Company	100	..	295	...
Galle Face Hotel Co., Ltd.	100	..	150	—
Kandy Hotels Co., Ltd.	100	...	127·50	...
Kandy Stations Hotels Co.	100	..	25	...
Mount Lavinia Hotels Co., Ltd.	500	..	200	..
New Colombo Ice Co., Ltd.	100	...	190	190
Nuwara Eliya Hotels Co., Ltd.	100	...	...	37·50
Do 7 per cent prefs.	100	..	—	105
Public Hall Co., Ltd.	20	15	16	—

LONDON COMPANIES.*

Company	paid p. sh.	Buyers.	Sellers.	Transactions
Alliance Tea Co., of Ceylon,	10	8½	9—10	.
Anglo Ceylon General Estates Co.	100	..	45—50	..
Associated Estates Co., of Ceylon	10	..	2—3	...
Do. 6 per cent prefs.	10	..	6½—7½	..
Ceylon Proprietary Co.	1	...	½—¾	..
Ceylon Tea Plantation Co., Ltd.	10	..	25—26	..
Dimbula Valley Co., Ltd.	5	..	5½—6	..
Do prefs.	5	..	..	...
Eastern Produce & Estates Co.	5	...	5—5½	..
Ederapolla Tea Co.,	10	...	8—10	...
Imperial Tea Estates Co., Ltd.	10	...	5—5½	...
Kelani Valley Tea Assen., Ltd.	5	..	5—6	...
Kintyre Estates Co., Ltd.	10	...	7—8	..
Lanka Plantation Co., Ltd.	10	4½	4—5	..
Nahalma Estates Co.,Ltd.	1	..	½—¾	..
New Dimbula Co., Ltd.	1	...	2¾—3	..
Nuwara Eliya Tea Estate Co., Ld.	10	—	..	...
Ouvah Coffee Co., Ltd.	10	..	6—7	...
Ragalla Tea Estates Co., Ltd.	10	..	10	10
Scottish Ceylon Tea Co., Ltd.	10	..	13—15	...
Spring Valley Tea Co., Ltd.	10	3	4—5	...
Standard Tea Co., Ltd.		..	11—11½	..
The Shell Transport and Trading Company, Ltd.	100	..		.
Yatiyantota Ceylon Tea Co., Ltd.	10	...	8—9	...
Do. pref. 6 o/o	10	...	7½—8	..

BY ORDER OF THE COMMITTEE.

Colombo, November 30th, 1900.

* Latest London Prices.

THE LOCAL MARKET.

(By Mr. James Gibson, Baillie St., Fort.)

Colombo, Nov. 29th, 1900.

COFFEE:—		
Estate Parchment per bushel	None	
Chetty do do	Nil.	
Native Coffee do F. O. B. per cwt.	Nil.	
Liberian coffee:—per bushel	Nil.	
do cleaned coffee:—per cwt	Nil.	
Cocoa unpicked:—per cwt	Nil	
do cleaned do	Nil	
Cardamoms Malabar per lb	R1·15 to 1·75	
do Mysore do	R1·60 to 2·00	
RICE:—		
Soolai per bag of 164 lb. nett	R9·23 to 9·52	
1st quality:—per bushel	R3·60 to 3·65	
Soolai 2 & 3rd. do do	R3·53 to 3·60	
Coast Calunda	R3·87 to 4·00	scarce
Coast Kara	R3 85 to 3·90	
Kazala	R3·47 to 3·50	
Muttusamba Ordinary	R5·75 to 6·00	
Cinnamon per lb No 1 to 4	52c to 54c	
do do 1 and 2	62c to 64c	
do Chips per candy	R90·00 to 92·50	
Coconuts Ordinary per thousand	R35·00 to 38 00	
do Selected do	R36·00 to 39·00	
Coconut Oil per cwt	R14·25 to 14·37	Business done
do do F. O. B. per ton	R285 00 to 287·50	Business done
POONAC:—		
Gingelly per ton	R100·00 to 102 50	
Coconut Chekku do	R80 00 to 82·50	
do Mill (retail) do	R85·00	
Cotton Seed per ton	R90·00 to 92·50	
Copra per candy		
Kalpitiya do	R45·50 to 46·75	
Marawilla do (Boat)	R41·00 to 46·50	
Cart Copra do	R36·00 to 43·00	
Satinwood per cubic feet	R2·00 to 2·25	
do Flowered do	R5·00 to 6·00	
Halmilla do	R1·90	
Palu do	R1·00 to 1·12	
Ebony per ton	R75·00 to 175·00	
Kitul fibre per cwt	R30·00 to 32·00	
Palmyra do do	R8·00 to 14·50	
Jaffna Black Cleaned per cwt	R13·00 to 14·50	
do mixed do	R11·00 to 12·00	
Indian do	R7·50 to 12·00	
do Cleaned do	R8·00 to 13·50	
Sapanwood per ton	R45·00 to 47·50	
Kerosene oil American per cases,	R7·00 to 7·25	
do bulk Russian, per tin	R3·12 to 3·15	
do Russian per cases	R6·37 to 6·50	
Nux Vomica per cwt	R2·00 to 6·50	
Croton Seed per cwt	R20·00 to 22·00	
Kapok cleaned f o b per cwt	R24·00	
do uncleaned do	R5·50	
Plumbago per ton, according to grade: Large lumps	R300·00 to 700·00	
Ordinary size lumps	R250·00 to 650·00	
Chips	R150·00 to 450·00	
Dust	R60·00 to 300·00	

COLOMBO PRICE CURRENT.

(*Furnished by the Chamber of Commerce.*)

EXPORTS.

Colombo, 26th Nov. 1900.

CARDAMOMS:—
All round parcel, well bleached per lb. R2 00
Do. dull medium do. 1·55
Special assortment, 0 and 1 only do. 2·10
Seeds do. 1·60

CINCHONA BARK:—
Per unit of Sulphate of Quinine 11c—For 1½ to 3 o/o.

CINNAMON :—
Ordinary assortment per lb. 59c.
Nos. 1 and 2 only per lb. 64c.
Nos. 3 and 4 only per lb. 54c.

CINNAMON CHIPS :—
Per candy of 560 lb R92·50

COCOA :—
Finest estate red; unpicked per cwt R60
Medium do do R56
Bright native, unpicked and undried R54
Ordinary do do do R46

COCONUTS—(husked).
Selected per thousand R48·00
Ordinary „ R38·00
Smalls „ R29·00

COCONUT CAKE—
Poonac in robins f. o. b. per ton R78·75
Do in bags None

COCONUT (Desiccated).
Assorted all grades per lb 14½c

COCONUT OIL—
Dealers' Oil per cwt R14·37
Coconut Oil in ordinary packages, f. o. b. per ton R325·00 Business done.

COFFEE.—
Plantation Estate Parchment on the spot per bus.—None.
Plantation Estate Coffee f.o.b. (ready) per cwt None.
Native Coffee, f.o.b per cwt.—None.

CITRONELLA OIL—
Ready do per lb. 65c.

COPRA—
Boat Copra per candy of 560 lb. R46·50
Calpentyn Copra do do R46·75
Cart do do do R43·00
Estate do do do R46·50

CROTON SEED per cwt None

EBONY—
Sound per ton at Govt. depot—R205.
Inferior R155. Next Govt. sales on Dec 3rd.

FIBRES—
Coconut Bristle No 1 per cwt R10·50
Do „ 2 „ None
Do mattress „ 1 „ 4·00
Do „ 2 „ 3·00
Coir Yarn, Kogalla „ 1 to 8 18·00
Do Colombo „ 1 to 8 16·00
Kitool all sizes 38·00
Palmyrah 16·00

PEPPER—Black per lb 33c.

PLUMBAGO—
Large lumps per ton R700
Ordinary lumps do 650
Chips do 450
Dust do 300
Do (Flying) 150

SAPANWOOD— per ton None

SATINWOOD (ordinary) per cubic ft. R2·50

TEA—	High Grown Average. cts	Medium Average. cts	Low Grown Average. cts
Broken Pekoe and Broken Orange Pekoe per lb	52	40	35
Orange Pekoe do	57	36	30
Pekoe do	42	33	30
Pekoe Souchong do	36	27	23
Pekoe Fannings do	31	19	19
Broken mixed—dust, &c. per lb	20	20	18

CEYLON EXPORTS AND DISTRIBUTION, FOR SEASONS 1899 AND 1900.

COUNTRIES	Tea. 1900 lbs.	Tea. 1899 lbs.	Coffee—cwt. Plantation	Coffee—cwt. N'tive	Coffee—cwt. Total.	Cocoa cwts.	C'moms lbs.	Cinnamon. Bales lbs.	Cinnamon. Chips. lbs.	Coconut Oil. 1900 cwt	Coconut Oil. 1899 cwts	Copra cwts.	Desiccated Coconut lb.	Poonac cwts.	Coconuts. No.	Plumbago. 1900 cwts.	Plumbago. 1899 cwts.	Fibre.	Ebony cwts.
To U. K. ..	98781869	90885691	6716	..	6716	19757	291514	830928	224631	218489	149162	19524	7931366	2001	9264204	110772	160042	49384	280
„ Austria ..	23358	8231	..	..	..	..	..	1500	47600	8682	6173	30406	120310	...	2900	2	14	...	..
„ Belgium ...	22630	14424	76	..	76	684	...	84069	118662	1825	[illegible]	71711	495319	75001	150190	29460	35458	17793	...
„ France ..	267122	81180	68	...	68	78	3407	96680	41786	...	...	24140	17902	201	..	304	1014	638	430
„ Germany ..	304813	312379	350	..	350	526	63290	638223	502267	11384	8850	63603	1041501	84051	742820	46609	65157	13273	6011
„ Holland ..	2000	30211	..	..	..	...	...	18756	113848	..	..	..	130030	..	25050	912	77[illegible]7	490	...
„ Italy ..	5932	12471	..	..	..	...	519	150100	153380	..	404	22617	..	..	8002	..	15	..	45
„ Russia ..	8008581	3395262	128	..	128	..	..	..	...	..	..	93557	..	...	1790	1203	1188	6	..
„ Spain ..	15130	17800	..	...	..	...	..	209944	58800	..	..	..	...	...	...	..	...	..	..
„ Sweden ..	61490	63337	9	..	9	..	5171	2400	..	...	206	4403	...	..	..	303	409	300	...
„ Turkey ..	31210	18733	..	..	..	..	2120	1020	10	...	..	1	...	..	2000	...	..	..	...
„ India ..	728859	507120	169	4	173	5	77001	500	..	76109	59600	437	...	..	754750	1065	435	135	..
„ Australia ..	15127670	14271517	2375	..	2375	29	336	9040	19596	634	742	..	628485	42	...	1999	1166	3966	27
„ America ..	3704595	2837962	135	..	135	615	2641	229000	140400	[illegible]	87559	..	1550880	...	..	132543	277768	6791	..
„ Africa ..	202580	248615	19	..	19	..	2315	10500	2408	42	..	..	49625	...	2293203	..	..	2307	..
„ China ..	1093891	1201418	30	...	30	82	1800	82400	...	1034	3381	20	92743	...	1503	287	127	...	..
„ Singapore ..	100731	74492	1	..	1	675	1340	..	..	4543	22333	..	...	..	..	...	..	303	...
„ Mauritius ..	16583	90508	..	..	..	..	...	...	..	..	..	...	...	..	..	..	...	..	..
„ Malta ..	398023	231967	..	...	..	..	..	..	.	...	...	...	..	..	...	..	..	..	..
Total export from 1st Jan. to 26th Nov, 1900	128897097	114303318	10076	4	10080	22461	451454	2365060	1423388	377100	340197	330419	12058161	161296	13246502	325459	550580	95389	6793

MARKET RATES FOR OLD AND NEW PRODUCTS

(From Lewis & Peat's Fortnightly Prices Current, London, October 31st, 1900

	QUALITY.	QUOTATIONS.
ALOES, Soccotrine cwt.	Fair to fine dry ...	44s a 85s
Zanzibar & Hepatic ,,	Common to good ..	20s a 60s
ARROWROOT (Natal) lb.	Fair to fine ..	5½d a 6¼d
BEES' WAX, cwt.		
Zanzibar & Bombay White ,,	Good to fine	£6 a £7 10s
Zanzibar & Bombay Yellow ,,	Fair ,,	£5 15s a £6 7s 6d
Madagascar ,,	Dark to good palish	£6 a £6 7s 6d
CAMPHOR, China ,,	Fair average quality	187s 6d
Japan ,,	,, ,, ,,	195s
CARDAMOMS, Malabar lb	Clipped, bold, bright, fine	2s 3d a 2s 4d
	Middling, stalky & lean	1s 5d a 1s 7d
Ceylon.—Mysore ,,	Fair to fine plump ..	1s [illegible]d a 3s 9d
	Seeds .	1s 6d a 2s
,, Tellicherry ,,	Good to fine ..	2s 11d a 3s
	Brownish .	2s 6d
,, Long ,,	Shelly to good ..	2s 11d a 3s 6d
,, Mangalore ,,	Med brown to good bold	1s 10d a 3s 6d
CASTOR OIL, Calcutta ,,	1sts and 2nds ..	4d a 4½d
CHILLIES, Zanzibar cwt.	Dull to fine bright ...	37s 6d a 47s 6d
CINCHONA BARK.—lb.	Ledgeriana Orig. Stem	3¾d a 6¾d
Ceylon	Crown, Renewed	5d a 7d
	Org. Stem	3¾d a 5½d
	Red Org. Stem	4⅜d a 5⅝d
	Renewed	5¾d a 7½d
	Root	3¾d a 4d
CINNAMON, Ceylon 1sts	Ordinary to fine quill	11d a 1s 8d
per lb. 2nds	,, ,,	10d a 1s 7d
3rds	,, ,,	9½d a 1s 6d
4ths	,, ,,	8½d a 11½d
Chips	,, ,,	3½d a 9d
CLOVES, Penang lb.	Dull to fine bright bold	5½d a 9d
Amboyna ..	Dull to fine	4½d a 5½d
Zanzibar and Pemba	Good and fine bright	3⅜d a 4⅛d
	Common dull to fair	3½d a 3¾d
Stems ..	Fair	1¼d
COFFEE		
Ceylon Plantation ,,	Bold to fine bold colory	100s a 118s
	Middling to fine mid .	85s a 97s 6d
	Low mid. and low grown	75s a 82s 6d
	Smalls	55s a 75s
Native	Good ordinary	30s a 70s
Liberian ,,	Small to bold	37s a 45s
COCOA, Ceylon ,,	Bold to fine bold	90s a 105s
	Medium and fair	8[illegible]s a 90s
	Native	72s a 80s
COLOMBO ROOT ,,	Middling to good	12s a 20s
COIR ROPE, Ceylon ton		nominal
Cochin ,,	Ordinary to fair ..	£13 10s a £18
FIBRE, Brush ,,	Ord. to fine long straight	£16 a £19
Cochin ,,	Ordinary to good clean	£18 a £24
Stuffing ,,	Common to fine	£7 a £9
COIR YARN, Ceylon ,,	Common to superior	£15 a £33
Cochin ,,	,, ,, very fine	£12 a £32
do. ,,	Roping, fair to good	£10 a £14 10s
CROTON SEEDS, sift. cwt.	Dull to fair	30s a 40s
CUTCH ,, ,,	Fair to fine dry	23s a 35s
GINGER, Bengal, rough ,,	Fair	28s 6d
Calicut, Cut A ,,	Good to fine bold	80s a 100s
B & C ,,	Small and medium	34s a 77s 6d
Cochin Rough ,,	Common to fine bold	25s a 33s
	Small and D's	25s a 29s
Japan ,,	Unsplit	27s
GUM AMMONIACUM ,,	Sm. blocky to fine clean	20s a 45s
ANIMI, Zanzibar ,,	Picked fine pale in sorts	£10 7s 6d a £20
	Part yellow and mixed	£8 2/6 a £10 10s
	Bean and Pea size ditto	70s a £9 2/6
	Amber and dk. red bold	£5 10s a £7 10s
	Med. & bold glassy sorts	80s a 100s
Madagascar ,,	Fair to good palish ...	£4 8s a £8
	,, red ...	£4 5s a £9
ARABIC E. I. & Aden ,,	Ordinary to good pale	35s a 60s
Turkey sorts ,,		67s 6d a 85s
Ghatti ,,	Pickings to fine pale ...	12s 6d a 35s
Kurrachee ,,	Good and fine pale ...	52s 6d a 55s
	Reddish to pale selected	30s a 40s
Madras ,,	Dark to fine pale ...	23s a 35s
ASSAFŒTIDA ,,	Clean fr to gd. almonds	40s a 85s
	Ord. stony and blocky	6s a 25s
KINO ,,	Fine bright	1s a 1s 3d
MYRRH, picked ,,	Fair to fine pale	90s a 107s 6d
Aden sorts ,,	Middling to good	50s a 60s
OLIBANUM, drop ,,	Good to fine white	35s 6d a 50s
	Middling to fair	25s a 35s
pickings ,,	Low to good pale	17s a 20s
siftings ,,	Slightly foul to fine	16s 6d a 18s
INDIARUBBER, Assam lb	Good to fine	2s 10½d a 3s 0¼d
	Common to foul & mxd.	1s 4d a 2s 6d
Rangoon	Fair to good clean ...	2s 3d a 3s 3d
Borneo	Common to fine	1s a 2s 4d

	QUALITY.	QUOTATIONS
INDIARUBBER, *(Contd).*		
Java, Sing. & Penang lb.	Foul to good clean ..	8d a 3s 3d
Mozambique ,,	Good to fine Ball ..	2s 8d a 3s 4d
	Ordinary to fair Ball .	2s a 2s 10¾d
	Low sandy Ball ..	1s 3d a 1s 7d
	Sausage, fair to good .	1s 6d a 3s 1d
	Liver and livery Ball	2s 4d a 2s 1½d
Nyassaland ..	Fair to fine ball	2s 1d a 2s 1¾d
Madagascar ,,	Fr. to fine pinky & white	3s a 3s 3d
	Fair to good black .	2s a 2s 10d
	Niggers, low to fine ..	11d a 2s 4d
INDIGO, E.I. ,,	Bengal—	
	Shipping mid to gd violet	3s 4d a 4s 4d
	Consuming mid. to gd.	2s 9d 3s 2d
	Ordinary to mid.	2s 4d a 2s 8d
	Mid. to good Kurpah	2s 2d a 2s 8d
	Low to ordinary	1s 10d a 2s 1d
	Mid. to good Madras	1s 6d a 2s 8d
MACE, Bombay & Penang	Pale reddish to fine	2s a [illegible]s
per lb.	Ordinary to fair	1s 4d a 1s 11d
	Pickings	1s 3d a 1s 4d
MYRABOLANS, Madras cwt	Dark to fine pale UG	6s a 7s
	Fair Coast	5s 6d a 6s
Bombay ,,	Jubblepore	4s 3d a 7s
	Bhimlies	4s 9d a 9s 6d
	Rhajpore, &c.	4s 3d a 8s
Bengal ,,	Calcutta	4s 6d a 6s
NUTMEGS— lb.	64's to 57's	2s 4d a 2s 6d
Bombay & Penang ,,	110's to 65's	11¼d a 2s 3d
	160's to 130's	6d a 11d
NUTS, ARECA cwt.	Ordinary to fair fresh	15s a 17s
NUX VOMICA, Bombay	Ordinary to middling	4s a 5s 6d
per cwt. Madras	Fair to good bold fresh	7s a 10s
	Small ordinary and fair	5s 6d
OIL OF ANISEED lb	Fair merchantable	6s
CASSIA ,,	According to analysis	3s 8d a 4s
LEMONGRASS ,,	Good flavour & colour	3d
NUTMEG ,,	Dingy to white	2d a 2½d
CINNAMON ,,	Ordinary to fair sweet	3¼d a 1s 6d
CITRONELLE ,,	Bright & good flavour	11d a 1/0½d
ORCHELLA WEED—cwt		
Ceylon ,,	Mid. to fine not woody .	10s a 12s 6d
Zanzibar. ,,	Picked clean flat leaf ..	10s a 16s
	,, wiry Mozambique	10s a 11s
PEPPER—(Black) lb.		
Alleppee & Tellicherry	Fair to bold heavy ..	6¼d a 6⅜d
Singapore ..	Fair	6¼d a 6⅜d
Acheen & W. C. Penang	Dull to fine	5¾d a 6¼d
PLUMBAGO, lump cwt.	Fair to fine bright bold	3[illegible]s a 40s
	Middling to good small	2[illegible]s a 32s
chips ,,	Dull to fine bright ..	10s a 20s
dust ,,	Ordinary to fine bright	5s a [illegible]0s
SAFFLOWER ,,	Good to fine pinky .	65s a 75s
	Inferior to fair .	40s a 60s
SANDAL WOOD—		
Bombay, Logs ton.	Fair to fine flavour ..	£20 a £50
Chips ,,	... ...	5s a £8
Madras, Logs ,,	Fair to good flavour ..	£20 a £50
Chips ,,	Inferior to fine ...	£4 a £8
SAPANWOOD Ceylon ,,	Fair to good ..	£5 a £5 10s
Manila ,,	Rough & rooty to good	£4 10s a £5 15s
Siam ,,	bold smooth ...	£7
SEEDLAC cwt.	Ord. dusty to gd. soluble	51s 6d a 59s 6d
SENNA, Tinnevelly lb	Good to fine bold green	5d a 8d
	Fair middling medium	4d a 5¼d
	Common dark and small	1¼d a 3½d
SHELLS, M. o'PEARL—		
Bombay cwt.	Bold and A's	£4 a £5 2s 6d
	D's and B's	
	Small ...	
Mergui ,,	Small to bold ..	£5 12/6 a £7 10s
Mussel ,,	Small to bold ...	18s a £2 10s
TAMARINDS, Calcutta...	Mid. to fine bl'k not stony	15s a 16s
per cwt. Madras	Stony and inferior ..	7s 6d a 11s
TORTOISESHELL—		
Zanzibar & Bombay lb.	Small to bold dark mottle part heavy	17s a 24s
TURMERIC, Bengal cwt.	Fair ...	28s nom.
Madras ,,	Finger fair to fine bold bright	25s a 27s 6d
Do. ,,	Bulbs ..	20s a 21s
Cochin ,,	Finger ..	24s
	Bulbs ...	7s 6d
VANILLOES— lb.		
Mauritius ... 1sts	Gd. crysallized 3½ a 9 in	17s 6d a 26s
Bourbon ... 2nds	Foxy & reddish 4½ a 8 ,,	15s a 21s
Seychelles 3rds	Lean and inferior ...	10s a 13s 6d
VERMILION lb.	Fine, pure, bright ...	3s 3d
WAX, Japan, squares cwt	Good white hard ...	35s 6d

THE

AGRICULTURAL MAGAZINE,

COLOMBO.

Added as a Supplement Monthly to the "TROPICAL AGRICULTURIST."

The following pages include the Contents of the *Agricultural Magazine* for December :—

Vol. XII.] DECEMBER, 1900. [No. 6.

REPORT OF MR. C. DRIEBERG, B.A., F.R.A.S., SUPERINTENDENT OF THE COLOMBO SCHOOL OF AGRICULTURE.

THE condition of the School of Agriculture remains the same as before, no provision having been made for giving effect to the improvements suggested by me in previous reports.

The Commission appointed by His Excellency the Governor "to inquire into and report on the advisability of establishing a Department of Agriculture" has made no recommendation with reference to the re-organization of the school, so that the long-deferred question of setting it on a better footing has still to be dealt with. At the request of the new Director of Public Instruction I have just drawn up a lengthy special report on the school.

The largest number of students on the roll in 1899 was 22, the average for the year 16. This is rather below the usual number (about 20), and is to be attributed to the uncertainty of the future of the school.

On the results of the final examination held in November, three students became entitled to the first-class certificate granted by the Department: E. Jayatilleke, G. Jayasinghe, and P. C. F. Fernando.

The third batch of Forestry students trained here passed out in February, and consisted of the following :—Messrs. J. S. Perera, M. B. Seneviratna, G. Rajapakse, W. E. Rowlands, W. Ferdinands, and D. E. Tiathonis. With their departure a new class was formed, composed of Messrs. O. M. Mack, F. Jayatilleke, E. C. Fernando, L. B. Tennekoon, D. C. de Silva, and J. F. Cooray.

The staff of the Colonial Veterinary Surgeon has been increased by the appointment of Messrs. D. Dias and A. M. Fernando (old boys of the School of Agriculture) as stock inspectors.

The Government Veterinary Scholarship for the study of veterinary science in Bombay was awarded to J. E. Fernando of the School of Agriculture, who left for India in November. The previous scholar, Veterinary Surgeon Chinniah, elected with commendable enterprise to start work on his own account, and now commands an extensive practice in Colombo.

I have nothing special to report as regards the Training School and Practising School.

The Government Dairy is now in its seventh year. The dairy herd was free from any form of contagious disease in 1899, and there were but six deaths for the twelve months, three among the cows and three among the calves. This is an excellent record considering the size of the herd. Thirty cows and three bulls were purchased at a cost of R1,564·86, while twenty-nine cows and two bulls and fifty-six young animals bred on the farm were sold for R4,337·26.

Milk to the value of R21,895 64 was supplied, of which R4,823·07 worth had to be purchased to meet the demand from the hospitals, which at different periods required more milk than the Dairy was able to supply. The necessity for the purchase of milk remains a serious defect in the

management, and the only way of avoiding it seems by the Dairy arranging with the Medical Department to supply only as much milk as it (the Dairy) produces. It should be possible to make a monthly forecast of the milk that the Dairy can supply under normal conditions, so as to permit the hospitals to arrange beforehand for the supply of milk in excess of the estimated quantity.

Mr. H. O. Morel, one of the agricultural students, who, with a view to acquiring a knowledge of dairying and cattle management, voluntarily acted as assistant to the Dairy Manager (with much acceptance), has become Manager of Mr. De Soysa's Bagatelle Dairy.

The following statements and returns are annexed :—

A.—Receipts and Expenditure of the Government Dairy, 1899.

B.—Receipts and Expenditure of the Model Farm, 1899.

C.—Financial Statement of Government Dairy and Model Farm, 1899.

D.—Capital Account of the Dairy.

E.—Balance Sheet showing the position of the Government Dairy Farm at the end of 1899.

F.—Live Stock Return.

The success which attended the Fruit and Flower Show held in 1898 suggested the resuscitation of the old Colombo Agri-Horticultural Society on 6th August of the same year. The first Show under the auspices of the revived Society was held at the School of Agriculture on 21st and 22nd July, 1899. The Exhibition, which was on a much larger scale than that held in the previous year, was a most successful event in every respect. After meeting all expenses connected with the Show a balance of R586·40 remained to the credit of the Society. It would, I think, be a good plan to hold future Shows in other centres in the Western Province besides Colombo; the benefit of the Show would then be more far-reaching than if they are always held in the capital.

The following is a record of the rainfall at the School of Agriculture for the year 1899 :—

	Inches.		Inches.
January ..	4·43	July ..	·66
February ...	2·66	August ..	1·01
March ..	1·73	September..	1·06
April ...	9·99	October ..	16·40
May ...	21·24	November..	6·89
June ..	12·73	December..	6·30

The total rainfall for the year was thus 85·10 in. The wettest month was April, but the greatest amount of rain which fell in any one day was 7·65 in., recorded on Friday, the 19th May—that is, between 9·30 A.M. on Thursday the 18th and the same time on Friday the 19th May. The total rainfall for 1899 fell short of that for 1898 by 1·48 in.

The Magazine published in connection with the school is now in its eleventh year, and the publication is, I am convinced, appreciated by those whom it is intended to benefit.

I trust that with the dawn of a new year and a new century some decisive step will be taken by Government towards placing the School of Agriculture on a better footing, whereby it may fulfil its object more worthily.

C. DRIEBERG,
Superintendent.

A.—*Receipts and Expenditure of the Government Dairy for the Year 1899.*

RECEIPTS.

		Amount. R. c.
January ...	To amount realized by sale of milk ...	2,041 98
February ...	do ...	1,680 52
March ...	do ...	1,816 68
April ...	do ...	1,817 87
May ...	do ...	1,857 5
June ...	do ..	1,803 29
July ...	do ...	1,752 15
August ...	do ...	1,888 91
September ...	do ...	1,757 26
October ...	do ...	1,801 43
November ...	do ...	1,763 2
December ...	do ...	1,864 48
	Amount of fees for the services of the stud bull	25 0
	Cost of carriage of milk ...	26 0
	Total ...	21,895 64

EXPENDITURE.

Expended in the purchase of milk ...	4,833 7
Paid to the Manager as part salary ...	300 0
Paid to Mr. Kuruppu as part salary ...	1·0 0
Paid as rent of the Havelock Race Course	720 0
Paid as rent of the meter for 1900 ...	32 0
Paid to Dairy coolies	1,525 0
Paid to grass land coolies	1 641 0
Expended in transporting milk ...	305 0
Expended in repairing the utensils and the building	120 46
Expended in purchase of castor meal manure for grass lands	135 0
Expended in purchase of oil and medicines	127 94
Paid for licensing three grass garden carts	15 0
Cost of keeping two calves at the Model Farm for six months	51 23
Cost of sealing wax, tape, and coir string	22 81
Cost of three hurricane lanterns ...	7 68
Cost of dieting Mr. H. O. Morel for one month	16 0
Sundries	2 30
Cost of provisions for the cattle ...	9,554 15
Nett profit	2,307 0
Total ...	21,895 64

B.—*Receipts and Expenditure of the Model Farm for 1899.*

RECEIPTS.

Receipts of the Model Farm for the year 1899		4,250 78
Rent of the bungalow		120 0
Do	Old link	3 0
Do	New link	150 0
Do	Health Depôt ...	36 0
Do	Grass for the Municipality	6 21
Damages for trees cut down by the Golf Club		49 0
	Total ...	4,614 99

Expenditure.	Amount. R. c.
Pay of the watchers	240 0
Rent paid to Government... ...	1,350 0
Nett profit	3,024 99
Total ...	4,614 99

C.—*Financial Statement of the Government Dairy and Model Farm for the Year 1899.*

1899.	Receipts.	
Dec. 31 ..	To purchase of stock in 1899	4,564 89
	To cost of advertising the sales and sending calves to Galle and Kandy	134 25
	To cost of extending the Dairy buildings	750 0
	To cost of getting two cases of dairy utensils from England	219 17
	To amount paid to the Manager for 1899: 6 per cent. commission on Rs. 2,307 ...	138 42
	To Balance at credit on December 31, 1899 ...	13,532 84
	Total ...	19,339 54

1899.	Expenditure.	
Dec. 31...	By balance at credit, January 1, 1899	9,604 29
	By nett profit of working the Dairy in 1899 ...	2,307 0
	By nett profit of working the Model Farm, 1899 ...	3,024 99
	By sale of stock, 1899 ...	4,337 26
	By interest allowed by Bank...	66 0
	Total ...	19,339 54

D.—*Capital Account of the Government Dairy.*

Receipts.

To amount expended from the sum of R22,980 voted for the establishment of the Dairy Farm in 1893	19,539 12
To amount of special advances for the working of the Dairy Farm received in 1894	11,500 0
Total ...	31,039 12

Expenditure.

By amount paid into revenue as proceeds of sale of milk in 1893	7,627 86	
Do in January, 1894	1,262 65	
		8,890 51
By amount paid to Treasurer in part settlemenet of the advance on December 31, 1895	5,237 35	
Do December 31, 1896	2,087 55	
Do Deeember 31, 1897	4,175 10	
		11,500 0
By amount paid on June 13, in part payment of the original vote	—	4,000 0
By balance of vote not repaid to revenue	—	6,648 61
Total ...		31,039 12

E.—*Balance Sheet showing the position of the Government Dairy at the end of* 1899.

Receipts.	Amount. R. c.
To balance of vote not repaid to Government	6,648 61
To assests over liabilities on December 31, 1899	26,269 23
Total ...	32,917 84

Expenditure.	
By amount paid as compensation to the late lessees of the Model Farm from the sum voted	4,400 0
By estimated value of Dairy stock and utensils	14,985 0
By balance at credit on December 31, 1899	13,532 84
Total ..	32,917 84

F.—*Live Stock Return of the Government Dairy for the Year* 1899.

Particulars.	Balance in hand on Dec. 31, 1898.	Purchased during the Year.	Born during the Year.	Total.	Died during the Year.	Sold during the Year.	Not to be struck off the List.	Total.
Cows ...	84	30	—	114	3	29	32	82
Calves .	94	13	21	128	3	56	59	69
Stud bulls..	3	3	—	6	—	2	2	4
Draught bulls ..	4	—	—	4	—	1	1	3

RAINFALL TAKEN AT THE SCHOOL OF AGRICULTURE DURING THE MONTH OF NOVEMBER, 1900

1	Thursday ..	Nil	19	Monday ..	1·39
2	Friday ..	·06	20	Tuesday ..	·27
3	Saturday ..	Nil	21	Wednesday ..	·04
4	Sunday ..	Nil	22	Thursday ..	Nil
5	Monday ..	Nil	23	Friday ..	·27
6	Tuesday ..	Nil	24	Saturday ..	Nil
7	Wednesday ..	Nil	25	Sunday ..	·43
8	Thursday ..	·40	26	Monday ..	Nil
9	Friday ..	Nil	27	Tuesday ..	·49
10	Saturday ..	Nil	28	Wednesday ..	·39
11	Sunday ..	Nil	29	Thursday ..	Nil
12	Monday ..	·11	30	Friday ..	·89
13	Tuesday ..	·92	31	Saturday ..	Nil
14	Wednesday..	·14	1	Sunday ..	·23
15	Thursday ..	·01			
16	Friday ..	1·04			
17	Saturday ..	Nil		Total..	6·98
18	Sunday ..	·40		Mean..	·23

Greatest amount of rainfall in any 24 hours on the 19th instant, 1·39 inches.

Recorded by Mr. C. DRIEBERG.

THE GOVERNMENT DAIRY AND DAIRYING IN COLOMBO.

The Administration Report of the Director of Public Instruction for last year contains the following appreciative remark with reference to the Government Dairy:—"The Dairy has done well, as usual. It has supplied excellent milk to various hospitals, and—what is still more important—it has introduced a useful breed of cattle into the Island."

The financial statement attached to the report of the Superintendent of the School of Agriculture not only shows the working of the Dairy for the past year, but reviews the result of its work since its establishment up to the date of the report, and this retrospect only goes to prove the fact that as a commercial undertaking this instruction has been a success.

Now there are many who would be inclined to ask how this success has been attained. We take it that it is to be ascribed to more than one cause. Of these, the selection of a useful breed of cattle, referred to by the Director, is perhaps the most important. To attempt to carry on a Dairy with the breed of cattle native to Ceylon would be a foolhardy undertaking, as good milking qualities—if they ever existed in them—long ceased to characterise these animals. The ordinary South Indian or "Coast" breed of cattle found in our cattle marts, and usually kept as milking stock by the Tamil cattle-keeper and milk vendor, only suits the conditions of this class of people, and is by no means adapted to the requirements of an establishment such as the Government Dairy, the reason being that the average output of milk is too small for successful working. It must be remembered that the produce of dairy cows should realize enough not merely to pay for their feed but also for their attendants, and for both not only during the period they are in milk, but also when dry and until they come into full milk again. In addition to all this there must be the margin of profit. Of course in the case of the native milkman the cost of attendance will be saved, as the owner himself tends his animals. There may be other good milking breeds of Indian cattle, but they have yet to be discovered and introduced into Ceylon *as profitable dairy stock* that will do well when kept in large numbers. The so-called Nellore cow and the English cow may thrive under special conditions and with individual attention, but they are unsuitable for a dairy of any size. The introduction of the Sind breed into Ceylon must, therefore, be put down as one of the chief factors in the success of the Government dairy, and for this the Superintendent must take credit, as nothing was known of these cattle in Ceylon till he "discovered" them and arranged for the first consignment of stock for the dairy.

The adequate provision made in the way of building and grazing accommodation, and the precautions for preventing the Dairy Stock coming in contact with outside cattle, are other causes of the Government Dairy's success. The cows of the native milk vendor are usually poorly housed in crowded, ill-ventillated and damp localities, and either permitted no exercise or allowed to wander about roadsides at nights, exposed to the night air, so that they might find grazing as best they can and at the same time take the risks of contracting contagious and infectious diseases, which, for want of a sufficient surrounding area, even threaten them in their sheds.

Another matter to be remembered as regards the Government Dairy is that it is under good supervision and good management, both of which are wanting in the so-called dairies scattered about the town, where no rules or regulations are enforced for carrying out the various operations involved in good dairying. Is it any wonder then, with so precarious a livelihood, that the native dairyman resorts to illicit means in order to supplement his legitimate income?

CLINICAL NOTES.

By D. A. Chinniah Veterinary Surgeon.

A case of cancer in a slut came under my treatment about two months ago. The animal was brought to me on the 12th of September in a very emaciated condition, and as she shewed great weakness I could not perform the complete operation I decided on. For the same reason I dispensed with the use of chloroform, and then proceeded to make a vertical incision in a line with the anal and vaginal openings.

Under proper antiseptic precautions I inserted my fingers into the cavity and after a vaginal and rectal examination with the help of my left hand, I was able to trace and draw out the horns of the womb, but instead of removing the ovaries I only cut off about 2½ inches of the horns together with the neck and appendages. The wound having been sutured and treated for some time, I performed a further operation on the 8th of October, and removed the cancerous mass. I had the satisfaction of ultimately seeing this dog regain its health. I may mention that the animal was the property of Mr. Chapman Dias of Mutwal, Colombo.

Subsequent to my first operation for worm in the eye (*Filaria Occuli*) performed on the 22nd of April last year, I had two other cases brought to me. One came a day after it had been unsuccessfully punctured by a farrier and the other was sent from Matara in a state of complete blindness,—this animal, too, I was led to believe, having been previously punctured without good results. This subject was a property of Dr. Asserappa, and it was sent for the operation on the 8th of October. As on the previous occasion, I threw my animal, but dispensed with the use of Cocaine. I tried to use the speculum for the first time in this operation, but abandoned it finding my fingers more effectual in preventing the eyeball from moving. With the help of a candle light—which brings the parasite to the surface—I found no difficulty in removing the worm. In both the cases the eyes were restored to their former useful condition.

PRACTICAL HINTS TO HORSE-OWNERS.

By D. A. Chinniah, o.s.v.c.

Chap. II. (*continued*).—Food and Feeding.

The question of *quantity* of food can only be decided on after considering the digestive capacity of the animal, his speed, amount and nature of work, and the climate in which he is being used. The time of feeding must also to a great extent be regulated by the owner.

It is not advisable to use an animal much before two hours after feeding, as otherwise there will be a tendency to indigestion, and colic and other stomach troubles may result. In England horses are fed as frequently as four or five times a day, but in Ceylon they are fed twice or at the most three times. As digestion in hot climates is slow, frequent feeding is not advisable. A fact that is as a rule ignored is that the concentrated food (grain, pulses, &c.) requires more time to be digested than the natural herbaceous diet. It is quite common to see a *muttu* giving his horse an allowance of grass just after he has had his regular feed. This is not to be recommended. Let us for a minute consider the physiological functions of the horse's stomach in relation to digestion of food. The stomach of the horse is for its size the smallest among our domestic animals. The digestion of concentrated foods (grain &c.) takes place mainly in the stomach itself, and the time occupied in the process varies approximately from 2½ to 3 hours. On the other hand the digestion of the bulky grass or hay takes place in the larger intestines, while the absorption of water is carried on in the colon. On these physiological facts are based the following rule as regards feeding :—First give water, second give the grass, and third give the grain. It may not always be convenient to adopt this sequence, but it is as well to instruct *muttus* not to give water or grass for about three hours after the concentrated food has been consumed.

The main advantage of feeding horses on concentrated food is that the capacity of the digestive canal is reduced, and that this allows of greater scope for the expansion of the lungs required by fast work. Ignorant of this fact, the hired-gharry muttu makes a point of stuffing his horse with grass during intervals of work, and in this way ruins its digestion. Overloading the intestines just before work impedes the action of the lungs and causes *broken wind*, commonoly referred to as "panting."

Visitors to Ceylon who spend the greater part of their time in plying about in hired gharries, know the inconvenience of being drawn by horses attached to these vehicles, and Prof. Wallace on a recent visit made special note of the "ruined digestions" of the common hired horses, caused undoubtedly by the indiscriminate use of grass and water during intervals between work. As a result, some of these unfortunate animals are found, to move with difficulty and discomfort to the accompaniment of natural barrel organs within their stomachs!

SIR JOHN LAWES—HIS LIFE AND WORK.

(*Concluded.*)

About 130 papers and reports on the Rothamsted experiments have been published, most of them in the joint name of Sir John Lawes and Sir Henry Gilbert. It would serve no purpose to enumerate the different subjects treated of, suffice it to say that much information of a useful character and founded upon the valuable data supplied at Rothamsted was given to the world in these papers. Sir John also contributed voluminous papers to the philosophical transactions of the Royal Society, the Journal of Chemistry and other Scientific Journals, and drew up two valuable reports which were presented to Parliament. He also appeared on several occasions as a lecturer on agricultural and allied subjects. A few years ago the Rothamsted papers were collected in seven octavo volumes for presentation to various national institutions throughout the world.

The unique feature of Rothamsted—which is the oldest Agricultural Experimental Station in the world—is the long unbroken continuity of its investigations. It would have been nothing less than a national calamity had these ceased at the death of their founder. Sir John Lawes must have felt this, for he foresaw it, and with laudable munificence and admirable public spirit set asid a sum of £100,000 for their permanent cone tinuance. The fund is administered by the Lawes Agricultural Trust Committee, the work of which began ten years ago, and will now go on uninterruptedly despite the lamentable death of the donor.

Prior to his death Sir John was approached with the view of his occupying the office of President of the Royal Agricultural Society, but his advancing years and the infirmities of age prompted him to decline the high honour. Among the many honours that were bestowed on the late baronet, was the awarding of the Royal Medal jointly to himself and Dr. Gilbert by the Royal Society, of which he was a member. In 1893, the year of the jubilee of the Rothamsted Experiment, a national monument was raised to Sir John Lawes, and the highest in the land joined to do honour to "one of the most disinterested as well as the most scientific of our public benefactors," who had laboured for fifty years for the cause of agriculture.

In concluding his excellent account of the life and work of Sir John Lawes, Dr. Fream pays the late baronet this handsome tribute :—

In his successsul efforts to wrest from the soil its secrets, Sir John Lawes established facts which were unknown—undreamt of, even—in the pre-Victorian days, when he first began his experimental inquiries. Many of the truths that he discovered have now become incorporated with the stock of common knowledge, and have benefited the agricultural practice of all progressive countries. He worked, indeed, for mankind, and happily for the results, he was actuated throughout by an unswerving purpose. The fame of the Rothamsted Station is worldwide, and visitors from beyond the seas were always im-

pressed by the charming old Manor-house, so beautifully set among its sylvan surroundings, a fit type of the "homes of England." They invariably carried away, moreover,—as did all who visited the station,—agreeable recollections of the goodness of heart and the courtesy of the great yet unassuming man whose remains were laid to rest, amid every sign of sorrow and respect, at the Parish Church, Harpenden, on Tuesday, September 4. Of him it might well have been written:—"Thou shall come to thy grave in a full age, like as a stock of corn cometh in his season."

MISS ORMEROD, ENTOMOLOGIST.

We received by the last mail, from the author, presentation copies of the Manual of Injurious Insects and Methods of Prevention, and a paper on Flies Injurious to Stock, by Miss Eleanor A. Ormerod, F.R., Met. Soc., &c., the Consulting Entomologist of the Royal Agricultural Society of England and Honorary and Corresponding member of various other societies connected with Agriculture and Entomology. The work is accompanied by an excellent portrait of Miss Ormerod from a photograph by Messrs. Elliot and Fry.

We learn from the agricultural press that Miss Ormerod has quite lately received the honorary degree of L.L.D. from the Edinburgh University, and she is the first lady so honoured. The subject of our notice, who has a world-wide fame as an Economic Entomologist, has for the past twenty-three years devoted her attention to the study of insect life injurious to agriculture.

Daughter of Mr. George Ormerod of Sedbury Park, Gloucestershire, she began the study of Entomology in 1853 from pure love of the science, and fifteen years later was awarded a silver medal by the Royal Horticultural Society for a remarkable collection of drawings and models illustrative of insect pests and their depredations.

Miss Ormerod's help has always been available to anyone communicating with her either in England and from abroad, and that too free of all charge. It is estimated that on an average she received and replied to 1,500 letters every year.

In addition to her scientific qualifications, Miss Ormerod reads freely Latin, French, German, Italian and Spanish, and with a dictionary at hand, also Russian, Dutch and Norwegian. Amongst her most appreciated scientific friends were Prof. Huxley, Prof. Westwood of Oxford and Dr. Riley of Washington. Miss Ormerod's residence is Torrington House, a beautiful place standing in a garden of about two acres, at St. Albans.

In the Preface to the new edition of her work Miss Ormerod makes special mention of the good work done by her sister Miss G. E. Ormerod, as her "colleague and unfailing and skillful helper." And in concluding the Introduction to the book, she writes: "I fully trust it may often be found of service in lessening the losses which at present (and often solely for want of having a little plain information at hand) add greatly to the burdens which weigh down agricultural prosperity," and goes on to promise "so long as it may be desired, and health and power are granted me, I trust to labour to the best of my ability in the cause of Injurious Insect Prevention." We would desire to record in the pages of this little magazine our own high appreciation of the admirable work done by this gifted lady, whose name is familiar enough even in far-off Ceylon, and to add the wish that she may possess an abundance of "health and power" to add to the good work she has carried on with so much ability. We hope to summarise in a future issue Miss Ormerod's excellent "introduction to Entomology."—containing many useful hints—for the benefit of our readers.

HINTS ON MANURING.

The following useful information is summarized from an article on Rational Manuring in the *Queensland Agricultural Journal*:—

Agricultural Chemistry has demonstrated that plant-life calls imperatively for three prime forms of food. These three are nitrogen, potash and phosphoric acid. The produce of the land (whether grain, grass, fruits, milk, &c.) remove from the soil large quantities of nitrogen, potash and phosphoric acid. A portion of these food elements would be returned to the soil if the manure of cattle kept in the land is used, but yet a good deal would still be lost, and the productive capacity of the land can only be maintained by the use of commercial fertilizers.

The most popular materials for supplying nitrogen, and which are largely used in the preparation of commercial fertilizers are nitrate of soda and sulphate of ammonia, in which the nitrogen is in a soluble and available form. Nitrate of soda is particularly adapted for top-dressing during the growing season, and is the quickest acting nitrogenous fertilizer. Leguminous crops are known to draw on the atmosphere for their nitrogen, and hence nitrogenous fertilizers are unnecessary for such crops. On the other hand by taking advantage of this property of leguminous crops, we may obtain from them a portion (and sometimes even all) of the nitrogen required by other crops. If ploughed under, the legumes will not only furnish nitrogen to the soil, but also humus, which improves its physical condition. This is known as "green manuring." On sandy land and in a hot climate, it is not advisable to plough under a heavy growth of these plants while in a green condition. If the soil is very deficient in vegetable matter, the crop should be allowed to die upon the land and then be ploughed under in cool weather. If it is necessary, however, to plough under a green crop, a good dressing of lime, not less than 30 bushels per acre, should be applied to prevent injurious souring of the land.

Barnyard or stable manure is regarded by many farmers as "a complete fertiliser." This is correct only so far as it contains all three of the fertilising ingredients, but these ingredients do not exist there in the proportions required by most crops. Stable manure contains propor-

tionately too much nitrogen and not enough phosphoric acid and potash to be considered a "complete fertiliser."

By a proper rotation of crops and by "green manuring," stable manure can, in fact, be dispensed with, and in some cases such a course is even preferable. The old saying that stable manure is indispensable to successful farming is not now regarded as an axiom. A manure containing an excess of nitrogen will unduly increase the growth of leaf and straw at the expense of fruit or grain. To avoid such a result, stable manure should always be supplemented with artificial fertilisers containing phosphoric acid and potash.

Wood ashes are a valuable source of potash, but the amount contained in them is small and variable. Muriate of potash (potassium chloride) is the cheapest form of potash and the best form, except in special cases where chlorine affects the quality of the crop, as with tobacco and oranges. For these latter sulphate of potash should be used. Kainit is another form of potash salt, containing the chloride, and is specially valuable on sandy soils. It is valued not only for its fertilising properties but for its beneficial effects as a destroyer of insect pests and a remedy in certain forms of plant disease.

The amount of kainit which should be added to fresh stable manure to prevent loss of ammonia through heating is 1 lb. per day for each cow or horse or for eight head of sheep. The kainit will save more than its cost in the value of the nitrogen which it retains, and will possess its original value as potash food.

Swampy and peaty soils, which consist largely of humus, and which, as a rule, are rich in nitrogen, derive only slight benefit from stable manure. Such soils need lime, potash, and often phosphoric acid. The application of these forms of fertiliser is followed by largely increased crops. Phosphoric acid and potash will prove of slight value when applied as "top dressing" during the growing season. When so applied, these fertilisers will stay on the surface and out of the reach of the roots of the plants. Phosphoric acid and potash are "fixed" or retained by the soil. They are not volatile, nor do they leach through the soil. It is quite different with nitrogen. When organic matter, exposed to the air, decomposes, a portion of the nitrogen present volatilises and is lost in the atmosphere. The remainder, unless absorbed by vegetation, is finally washed away. Nitrogen in the form of nitrates readily leaches through the soil. Nitrate of soda may, therefore, well be applied as a top dressing during the growing season.

The commercial fertilisers now in the market are the most desirable supplements and substitutes for stable manure that can be obtained by the farmer. In complete fertilsers the nitrogen, phosphoric acid, and potash are skillfully compounded in various proportions. They are in a finely ground and thoroughly commingled condition, can be applied by drilling, and can be easily mixed with the soil. Their value has been accurately determined by the various agricultural associations, and the interests of the farmer carefully protected.

THE CULTIVATION AND CURING OF TOBACCO.

1. *Soil and Climate.*

A light soil or sandy loam, well drained and containing an average amount of organic matter and rich in mineral matters is considered to be best suited for tobacco cultivation. Tobacco grown on clay soils is too coarse and inferior in quality, but clay soils usually give heavy yields. Soils rich in organic matter or humus produce a better sort of tobacco of the kind fit for making cigars than clay soils. The principal tobacco-growing districts of Bengal are Rangpur, Cooch Behar, Jalpaiguri, Purnea, Darbhanga, Mymensingh, Nadia, Muzaffarpur, Jessore and Manbhum Murshidabd, Dinajpur, Chittagong, Dacca, Tippera, Bhagalpur, Pabna, Monghyr, Cuttack, etc., named in order of importance. The Chittagong tobacco* commands the highest price in the market, viz., as much as R22 per maund, the Rangpur tobacco selling from R6 to R12 per maund. The tobacco of other districts enumerated above is sold at R3 to R7 per maund. Ignorance of the method of cultivation and of curing causes in many places inferiority in the quality of leaves, but the difference in flavour is, no doubt, also due to influences of the soils and climate.†

2. *Chemical Composition.*

Tobacco requires particularly good soil and heavy manuring, as it is richer in nitrogen and in mineral constituents than almost any other crop. The composition of the leaves vary very much in both nitrogenous and ash constituents according to the richness of the soil or the amount of soluble plant food contained in it. The amount of nitrates in leaves may be as much as 10 per cent of the dry matter. The ash of Indian tobaccos varies between 16 and 28 per cent, the greater part of which consists of carbonate of lime. The soluble portion of the ash chiefly consists of potash salts, the proportion varying from 5 to 35 per cent.

The following table taken from Johnson's "How Crops Grow," page 378, gives the average constituents of tobacco ash :—

Percentage of ash	24·08
Composition of the Ash.	
Potash	27·4
Soda	3·7
Magnesia	10·5
Lime	37·0
Phosphoric acid	3·6
Sulphuric acid	3·8
Silica	9·5
Chlorine...	4·5
	100·00

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* The Chittagong Hill Tracts produce the best tobacco in Bengal. This is generally used for making cigars by the Burmese. There are three varieties ; (1) Khao Doung ; (2) Mri Kheoung, and (3) Rigri Kheoung. The excellence of these varieties of tobacco, it is said, is due to the speciality of the soil rather than to any peculiar mode of cultivation or of curing. The leaves are cured in the way in vogue in Rangpur and Jalpaiguri.

† Cow-sheds are commonly used by the rayats for drying tobacco ; this gives a bad flavour to the tobacco.

Potash should occur chiefly as carbonate (or ordinary wood-ash,) in the soil, and the richness of a soil for tobacco is chiefly due to the abundant presence of nitrogen, potash and lime, as nitrates, carbonates, sulphates and phosphates. From this it will appear that the most appropriate manures for the tobacco crop are ashes (or crude potassium carbonate), saltpetre, gypsum and lime. But as manuring is expensive, soils naturally rich in nitrogenous and ash constituents, that is, very fertile soil should be chosen for growing this crop.

3. Rotation.

Tobacco is sometimes grown after jute or Indian corn has been harvested, but very often it forms the only crop of the year. It can be grown for three or four years successively on the same ground.

4. Seed-Bed.

The soil of the seed-bed is dug up with spade and manured with rotten cowdung and ashes and then raised artificially about 6 inches. When the ground has been well pulverised, it is levelled. Seed is sown thin, so that each seedling may have about one inch of space round it. After sowing, the seed is lightly covered up with earth. The seed-bed is kept covered with mats until germination takes place. It is necessary also to keep the seedlings protected from rain and heat of the sun. They may require to be watered at intervals of two or three days. Seed is generally sown in the middle of Bhadro (first week of September). In dry laterite soil it is best to do the sowing early, *i.e.*, about the second or third week of August. Half an ounce ($1\frac{1}{6}$ tola) of seed is to be sown to produce plant required for one acre; but loss invariably occurs owing to patches of seedlings growing too thick. It is therefore advisable to grow seedlings from one ounce of seed for one acre of land. Sometimes ants do considerable damage to seed and seedlings when ashes sprinkled round and over the seed-bed prove efficacious.

5. Preparation of Land.

The soil for the tobacco cultivation should be prepared during the months of August and September. Eight to ten ploughings are necessary. Deep cultivation and thorough pulverisation of the soil are most important. The soil should be liberally manured with well-rotted cowdung and ashes. The soil is then to be levelled with a light harrow. It is needless to say that even poor soil can be made to produce a good crop by proper tillage and heavy manuring. Soils destitute of potash, unmanured soils or soils manured with flesh, humus, calcium chloride, magnesium chloride and potassium chloride produce a bad burning tobacco which is unsuitable for making cigars. The use of cowdung also should be avoided in raising tobacco for the manufacture of cigars. Potassium carbonate, saltpetre, potassium sulphate, and calcium sulphate (gypsum) are the best manures for tobacco intended for cigars. They give to the leaves a sweet flavour and burning quality. Gypsum is excellent as a top dresser, and its use is particularly recommended to Indian cultivators. Crops manured with it suffer less from the effects of drought and require less irrigation. Gypsum is a byeproduct in the manufacture of the ærated waters and can be obtained very cheap,—at 4 to 8 annas per maund. The mineral manures are used generally from $2\frac{1}{2}$ to $4\frac{1}{2}$ maunds per acre. Ordinary household ashes also are an excellent manure for tobacco. They contain a large amount of potash and lime, and are particularly recommended for clay and humus soils.

6. Transplanting.

When the seedlings are about 3 inches high in the nursery, that is, after they have shown three or four leaves, which takes place within six weeks from sowing time, they are fit for transplantation. The transplantation begins in the beginning of Aswin (the 3rd week of September), and extends as late as the end of Kartick (middle of November). Early planting is preferable, especially for dry climates. The seedlings should be planted in the evening 3 feet apart from one another. Smaller varieties, as Hingly, Motihari, etc., may be conveniently planted 2 feet apart. The transplanted young seedlings are to be carefully watered for the first few days until they strike root. Irrigation may be afterwards necessary at intervals of about ten to twenty days, according to the nature of the soil. In Rangpur and Jalpaiguri a hand plough is repeatedly dragged by a man alternately along and across the tobacco fields, which serves the purpose of hoeing and stirring the soil. This is done until the flower buds are seen. In places where artificial Irrigation is required, regular hoeing is wanted—twice after each irrigation, or four times in a month.

7. After-treatment.

A few days before the plants run to flower, their buds and lower leaves shoud be nipped off, and they should be so pruned that only eight leaves, and on no account more than ten, may be left to each plant from the top. In Jalpaiguri finely-powdered earth is used to stop bleeding or overflowing of sap from the broken parts immediately after pruning. This mode should be followed in other quarters. Plants reserved for seeding should be topped in this way, but left to flower and seed. The plants always bring forth shoots by the side of the stalks of leaves pruned, and care should be taken to prune off the shoots every now and again until the leaves are mature. The longer these buds and shoots are kept, the more injury is done to the leaves required to be gathered.—*Indian Agriculturist.*

(*To be concluded*).

GENERAL ITEMS.

Senor V. Marcano, one of the leading medical authorities of Cuba, has discovered that the juice of the Pineapple materially aids in the digesting of the proteids of both animal and vegetable foodstuffs, while R. H. Chittenden, of the Connecticut Academy of Sciences, asserts that the fresh Pineapple juice is a constant and powerful digestant of albuminous matters, acting in both alkaline and acid media, but more energetically in neutral than in either of the others. In fact, chemists have separated the active digestant

principle and put it in the materia medica. This substance, closely analogous to pepsin, is known as bromelin. Pineapple juice has been found to be most efficacious in throat troubles and diphtheria, as the juice dissolves the fleshy tissue, such as is found in these ailments. A cure of diphtheria in a most marked and, in fact, abandoned case is reported in the *Druggists' Circular* as follows:—"For three or four years I have been hearing of the use of the Pineapple juice for the cure of diphtheria, but though little of it. Recently, however, it has taken better shape in the report of a case where the child was given up by the doctor, and a friend coming in remarked that he had known children relieved by the Pineapple. The physician in attendance said, 'Get it and try it; it can do no harm.' A ripe Pineapple was got and the juice expressed and given in teaspoonful doses slowly. It seemed to clear the throat, swallowing was much easier, and in a few hours the child was sleeping. Recovery followed. The Pineapple was used in a number of cases subsequently, with success, in the same neighbourhood, and the people think it better than medicine." In bronchitis, Pineapple juice has been found to be excellent medicine by Dr. Flascher in softening the mucus. His formula is as follows: "Slice the fruit, sprinkle with sugar, heat to boiling and strain. The dose of syrup so obtained is about two tablespoonfuls." In Cuba the Pineapple is highly esteemed from the fact that it is in general use as a mild laxative. From the Pineapple itself pharmaceutical chemists have separated a crystalline substance which they call mannitol, which is in active use in compounding prescribed medicines for throat and lung troubles.

In reference to the polishing of rice we read in the *Queensland Agricultural Journal* that according to the *Grocer*, fashion demands a bright lustre in rice placed on the European market, and this is secured by rubbing off a dull outer coating of the grain, which has been shown to have a food value nearly twice as great as the rice grain after polishing. The polishing process, however, greatly improves the appearance of the grain, and it is now almost universally practised in cases where the rice is intended for the markets of the West. The material secured off is sold under the name of rice flour. The polishing is effected by friction against pieces of moose hide or sheep-skin, tanned and worked to a wonderful degree of softness, losely tacked round a double revolving cylinder of wood and wire gauze. After the polishing the rice goes to the separating and shifting screens, made of different sizes of gauze, by which it is graded before packing.

The Banana seems much to the front at the present day, and comes in for a good deal of laudation: the banana plant, says M. de Lovedo, in *El de Progress Mexico*, will feed 150 men from the product of one hectare of land so planted; while the same area in wheat would only supply food for six individuals; for the same space and under similar conditions of cultivation, its produce is 40 times that of potatoes and 100 times that of wheat. The fruit of the banana contains 72 per cent of water, 2·14 per cent of nitrogenous matter, and 22 per cent of saccharine substances, the latter giving it its great nutritive quality.

We have all heard of mummy wheat which is said to have been raised from grain found in the hands of Egyptian mummies some 3,000 years old, and now comes the story which we read of in the *Queensland Agricultural Journal* of Mr. R. A. Stewart, a saddler of Kowes, Isle of Bute, growing peas from seed found in the tomb of an Egyptian king! A characteristic of this pea is that the white flowers have a beautiful red centre, surrounded by a white corona. The plants grew up strong and vigorous to a height of 6 feet, the pods averaged 2 to 3 inches by half an inch, and the peas are said to be of excellent flavour.

The chief Camphor-producing country is Formosa, where it is a Government monopoly. The reason for making it such appears to have been, among other reasons, the reckless destruction of trees and the great fluctuations in price, as well as the want of uniformity in quality in the article previously. The Government has passed strict forest regulations, and by wire forest administration Formosa is capable of supplying the world with 6,000,000 or more pounds (English) of camphor annually. The quality is established, and the price fixed not only locally but abroad. Tenders are invited for the lowest price of sale in foreign markets, and in March, last year, the monopoly of sale in foreign markets was secured by Mr. T. Arai of Messrs. Samuel, Samuel & Co. The above interesting facts are recorded in the *Brisbane Courier*.

The *Louisiana Cultivator* referring to Indian corn says:—This wonderful plant that can so nearly supply all the food required for man and beast, bids fair to do still better in the early future. While it is now the dominant crop in American agriculture, it seems to promise even higher food values in the future. It stands supreme as a fattening food, and the bassis of fat cattle and pigs in America. It is also fed largely to working animals, and analyses show that it contains sufficient protein to make it reasonably good food for them, though not so good as oats, the typical worker's food, because of its high proportion of protein. This nitrogenous matter it found chiefly in the germ of Indian corn, hence the size of the germ in a measure indicates the proportion.

If tomato plants show signs of disease by the unhealthy appearance of the leaves, or scabby fruit, they should bo at once sprayed with Bordeaux mixture of a strength of 4 lbs. bluestone (sulphate of copper), 4 to 6 lbs. quick lime and 40 gallons water.

What does an inch of rain mean? Few persons have a definite idea. An acre, if calculated out,

will prove to be 6,272,640 square inches. An inch deep of water on this acre will be as many cubic inches of water, which, at 231 to the gallon is equal to 27,154 gallons. This immense quantity of water will weigh 228,190 lbs. or 114 tons. One hundredth of an inch (·01) alone is equal to over one ton of water to the acre.

It was reported in the *Government News* some time ago that for some unaccountable reason a large proportion of the rice grown in South-west Louisiana turned out red. The coloured rice was found by chemists to be as nutritious as the white, but still there is a prejudice against the former and this affected the selling price.

The following recipe is given by the *Queensland Agricultural Journal* to prevent rust: Melt one lb. lard and one ounce camphor. Skin the mixture carefully and stir in a sufficient quantity of black lead to give the metallic colour. After clearing machinery thoroughly, smear with the mixture and let it remain for a day and then rub clean with a soft cloth.

Says the *Sydney Mail*:—Small particles of cinder and metal are constantly getting into the eyes of engine-drivers and stokers. They have one invariable way of getting them out. No sooner has the driver of an engine got a nasty bit of grit in his eye, then his companion, the stoker, opens the eyelids quite wide and licks out the unseen fragment—which might produce tragic results sometimes—with his tongue. The public knows little of this heroic remedy, but on every line in the world it is being applied every hour of the day. All surgeons recognise that this is often, with all their beautiful instruments, the only way. And amongst the thousands of women connected with the English fishing trade who have to clean herrings it is also practised as the only method of getting out of the human eye the very minute herring scales that lodge there and soon produce serious mischief if not removed.

Four hundred pounds weight of hen manure is equal in value to 2,400 lb. of farmyard manure. In a ton of fowl manure analysis showed 48·60 lb. phosphoric acid, 48 lb. potash, and 67 lb. nitrogen; whilst farmyard manure contained only 6 lb. phosphoric acid, 10 lb. potash, and 11 lb. nitrogen in one ton. Much of the value of any manure depends upon its freshness, and whether it has been kept under cover and dry.